



# LINUX

System Administration

Lab Manual





# **LINUX**

## **System Administration**

**RHCE Mapped Course**

**Lab Manual**



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# Introduction

This lab manual has been designed as a supplement to the Linux Server Administration course offered by Zoom Technologies.

We have taken care to ensure that this serves as a comprehensive reference manual for the Linux administrator. The exercises have been arranged in order of increasing complexity, starting from the installation of the Linux OS right up to web server administration and covering everything else in between.

It has been written in a simple and easy style, with plenty of screenshots wherever required and the syntax clearly given before each command. As with our other lab manuals, we have used the same structure for these exercises, with each exercise divided into five sections:

1. Objective
2. Topology
3. Prerequisites
4. Configuration
5. Verification / Result

We hope that this will serve as a useful guide to the Linux professional, not only during the course but in actual implementation at the workplace. We have tried to ensure that no errors or mistakes creep in, but suggestions and feedback to improve this manual are always welcome.



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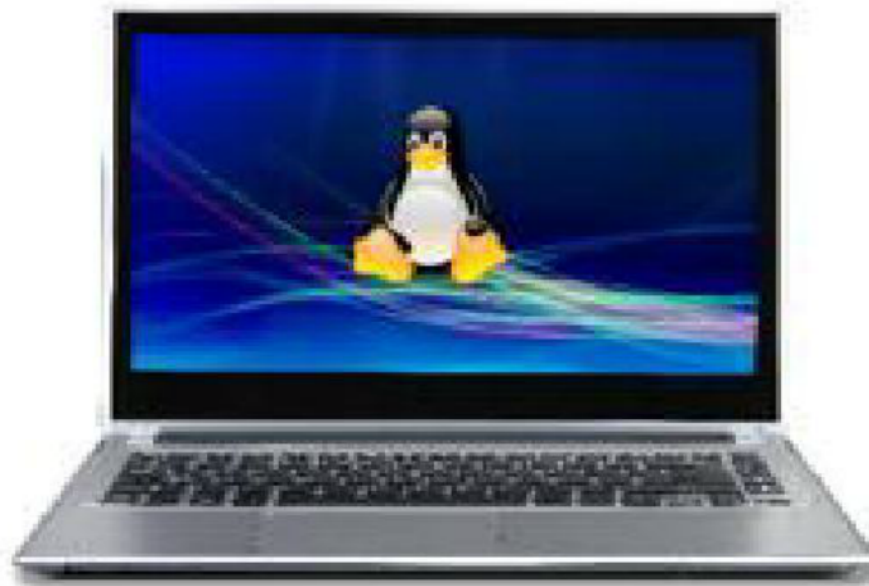
## LAB 1: INSTALLATION OF LINUX OPERATING SYSTEM

**OBJECTIVE:**

To install Linux Operating System.

**PRE-REQUISITE:**

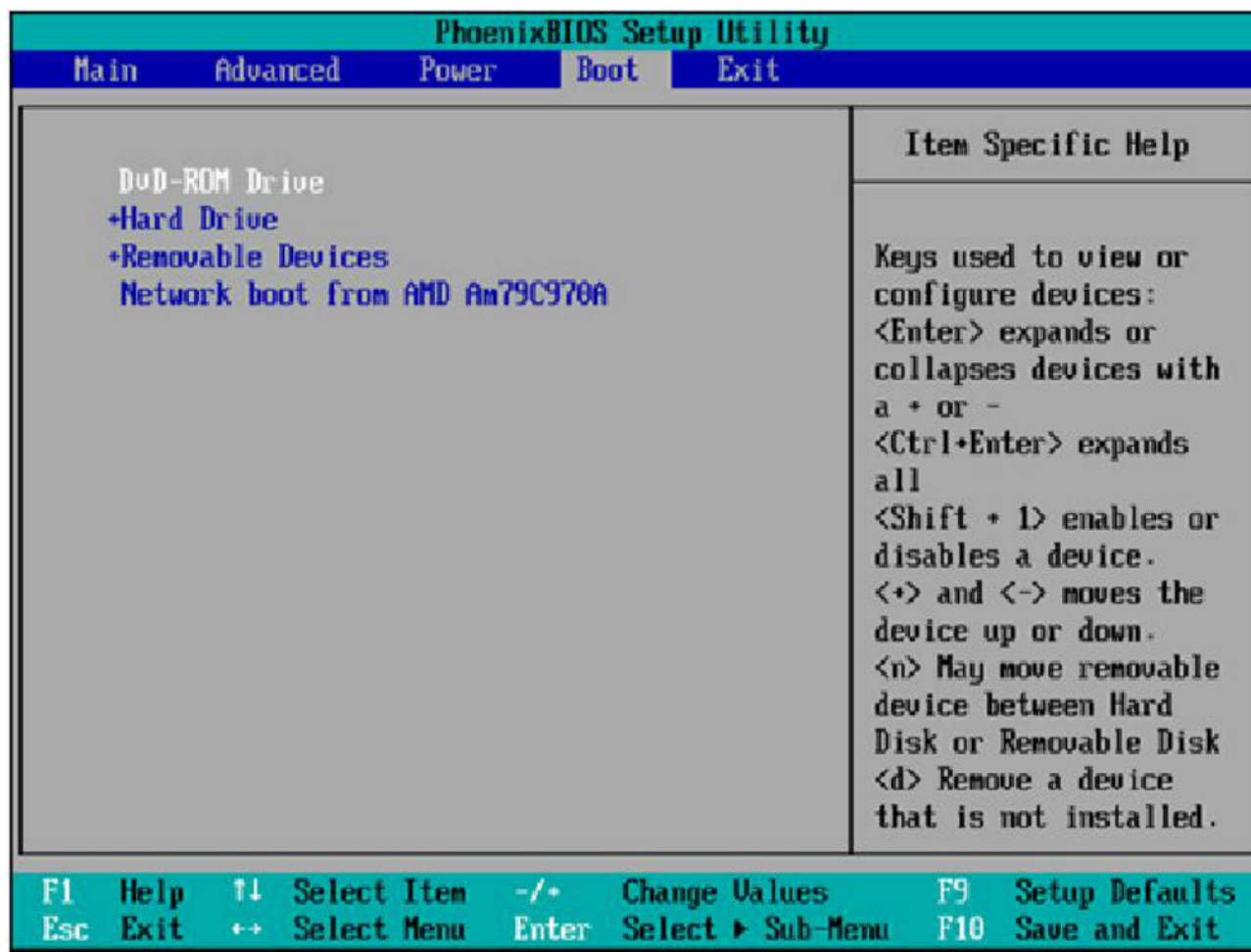
A user should have a system along with OS DVD.

**TOPOLOGY:**

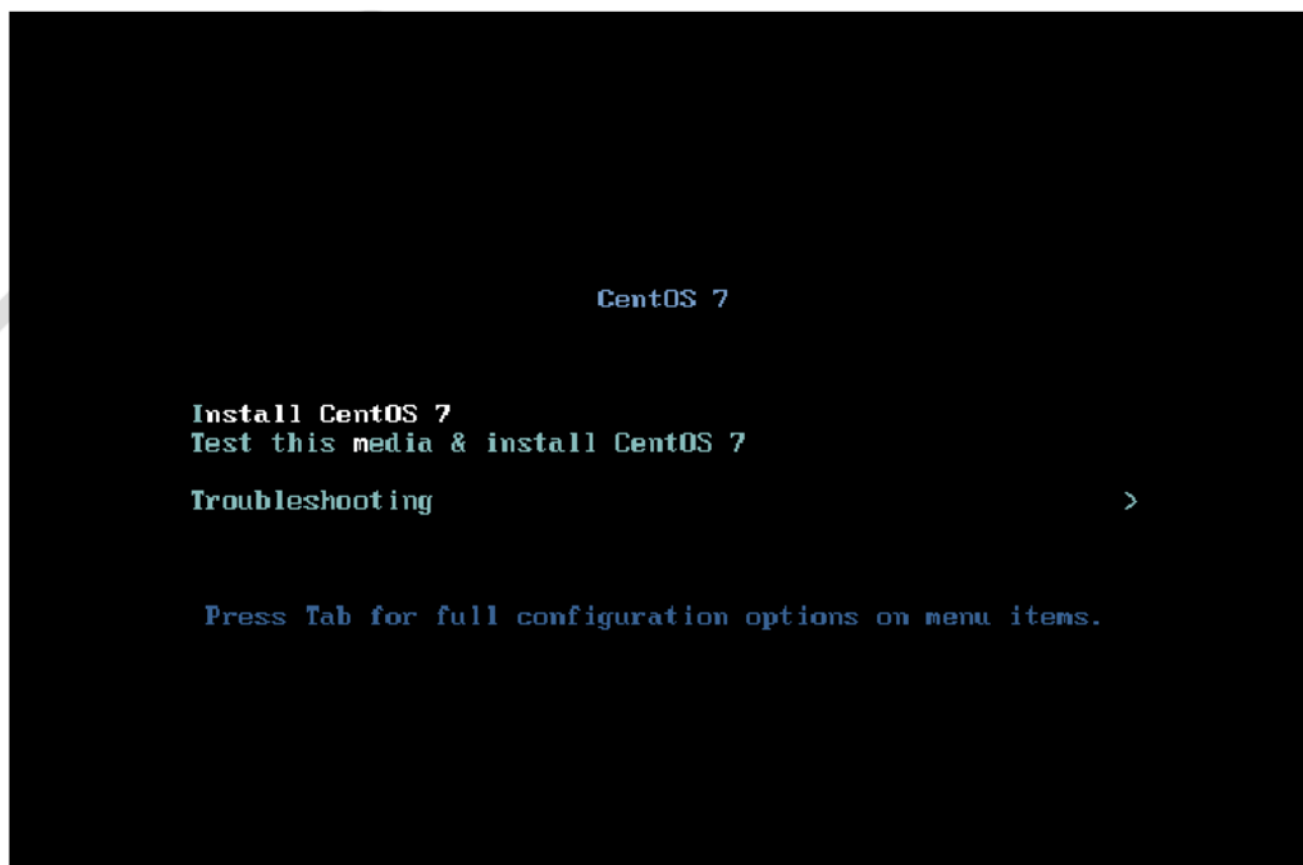


## Steps to Install Linux

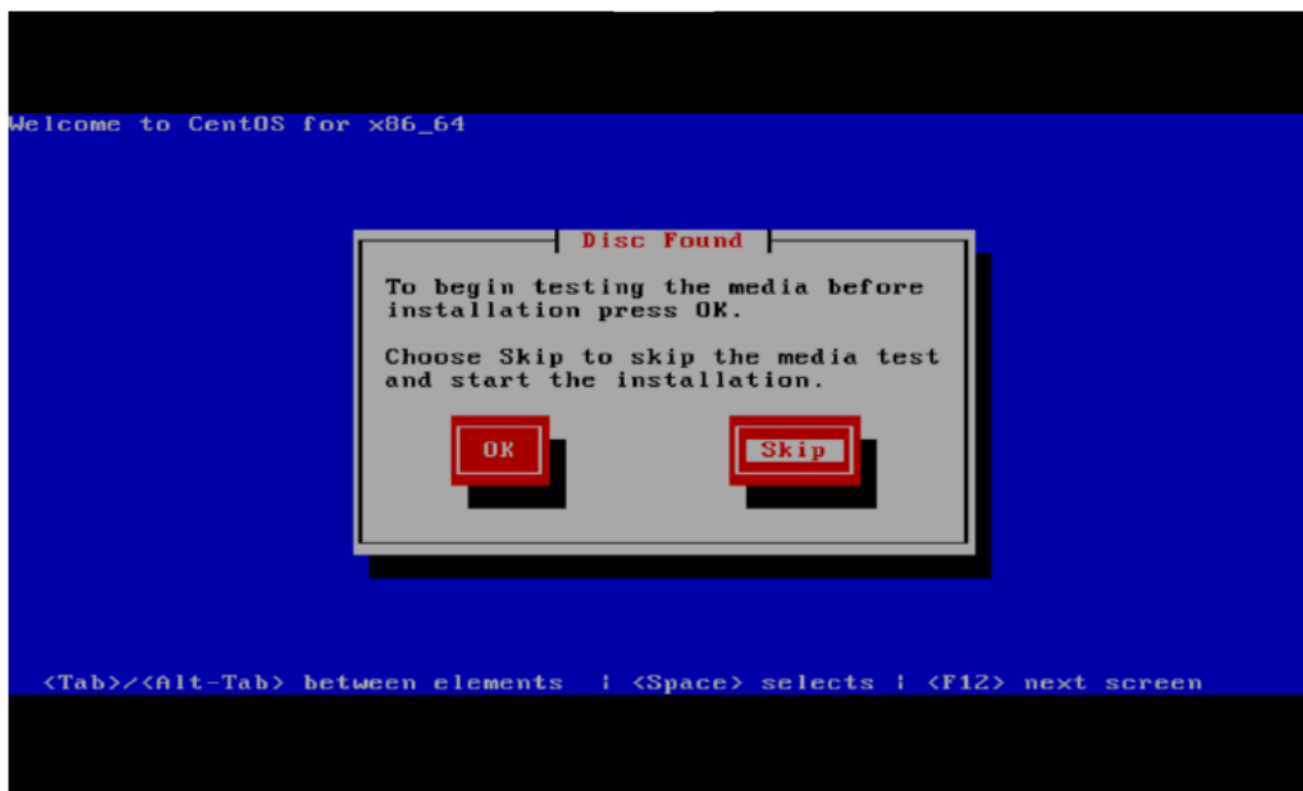
1. Restart the System and go to **BIOS**.
2. Set the First Boot Device as **DVD ROM**.



3. Save the settings by Pressing **F10** and click **YES**.
4. Insert **LINUX DVD** and **Restart** the system.
5. Select **Install CentOS 7** option to install new Operating System



6. Select **skip** to avoid media test



7. Press **ENTER** to proceed with installation



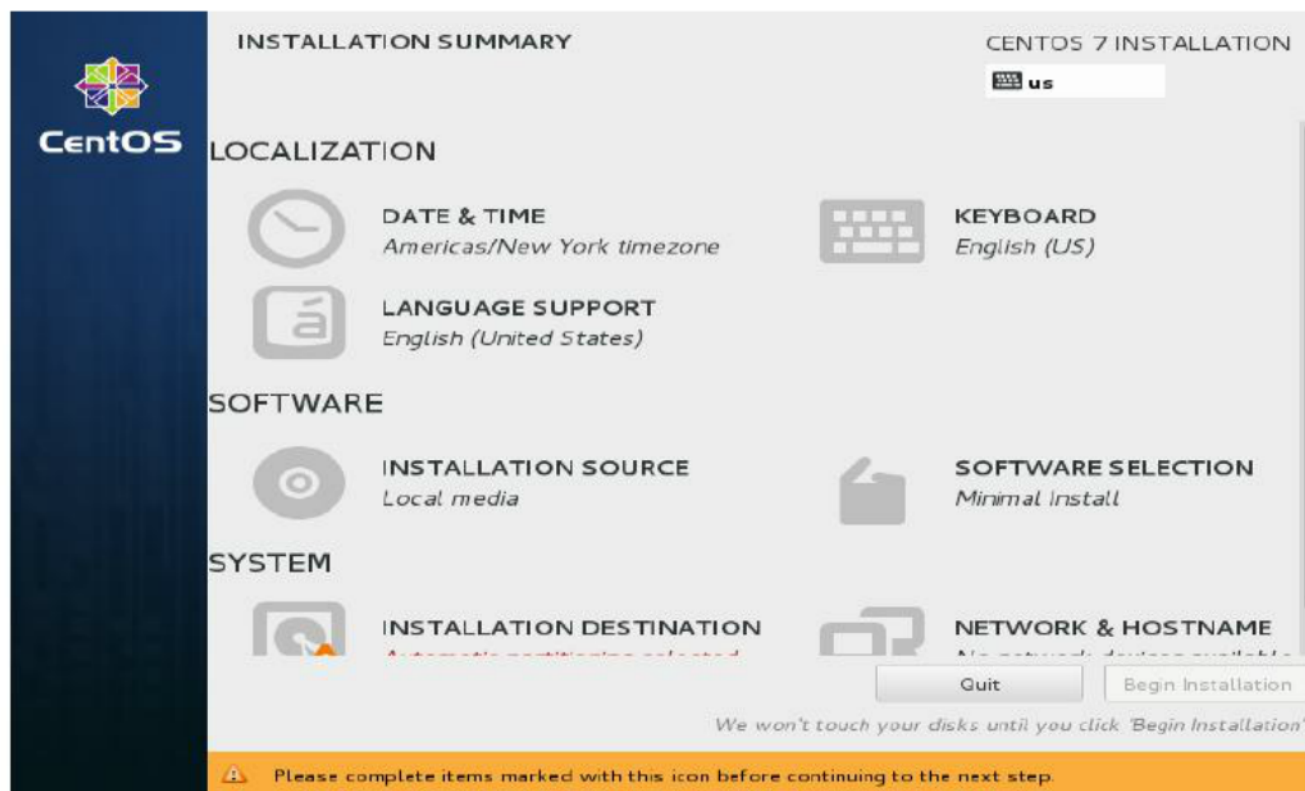
8. Verify installation language e.g.: **English** and click **next**



9. Make sure it is the right installation language e.g. **English** and click **next**

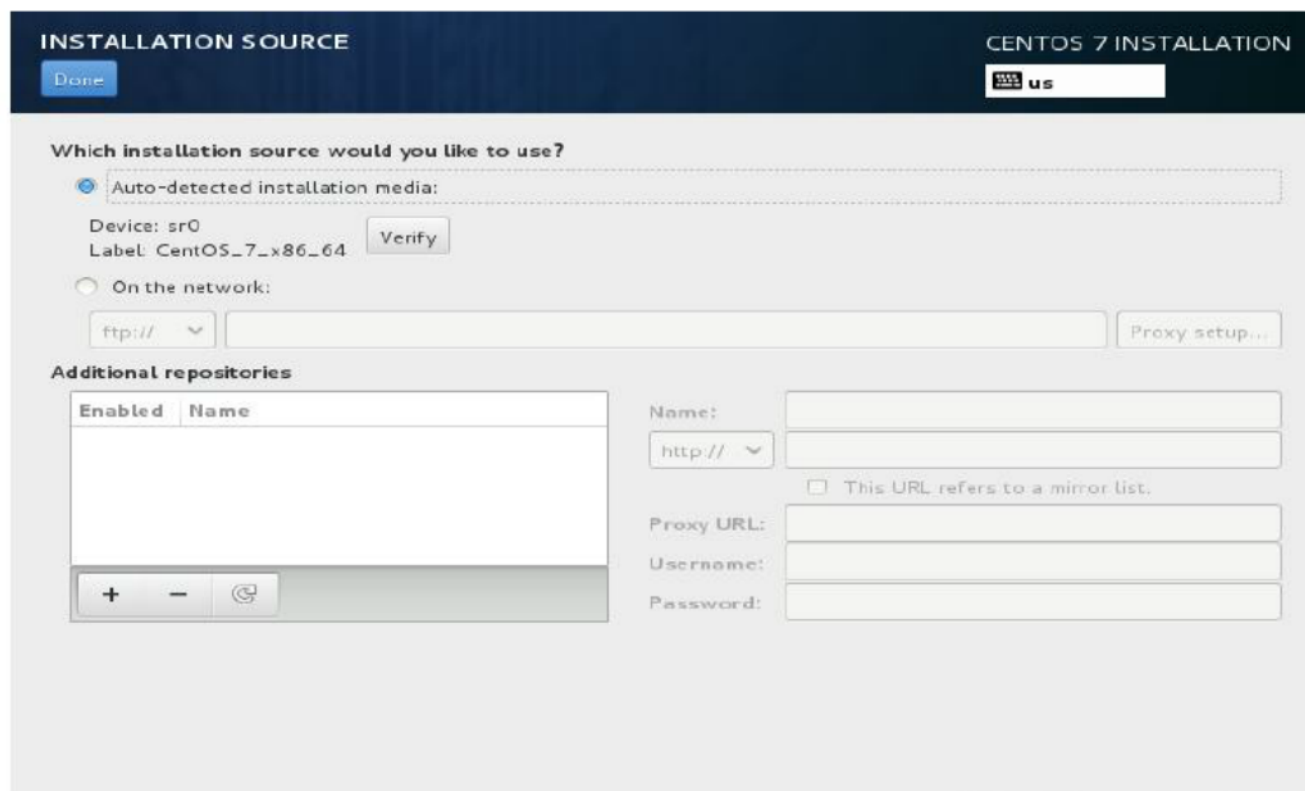


## 10. Window of installation summary

11. Select time zone e.g. **Asia Kolkata** and click next



12. Provide installation **source** and click next



**INSTALLATION SOURCE** CENTOS 7 INSTALLATION

[Done](#) us

Which installation source would you like to use?

☒ Auto-detected installation media:

Device: sr0  
Label: CentOS\_7\_x86\_64 [Verify](#)

☐ On the network:

ftp://  [Proxy setup...](#)

**Additional repositories**

Enabled	Name

[+](#) [-](#) [C](#)

Name:

http://

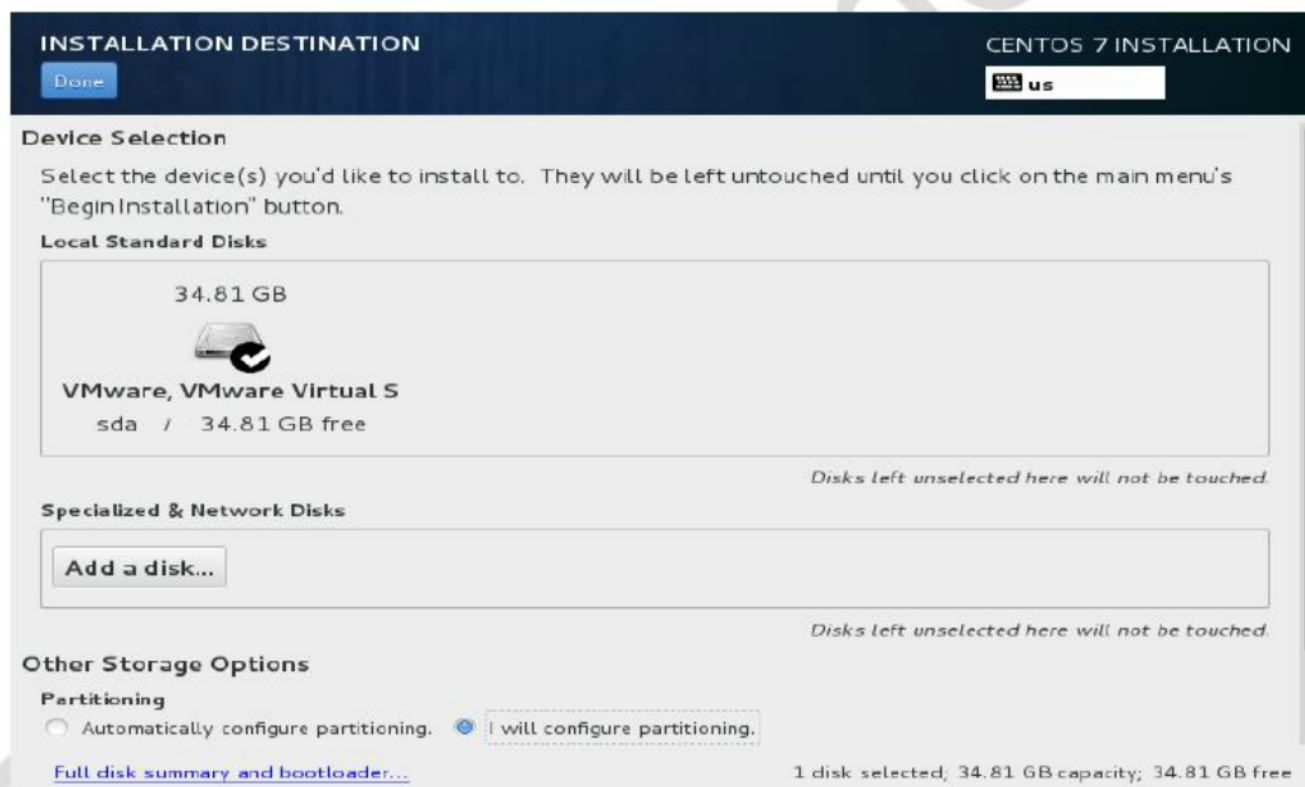
☐ This URL refers to a mirror list.

Proxy URL:

Username:

Password:

13. Select **Hard disk**--->"I will configure partitioning" and click next



**INSTALLATION DESTINATION** CENTOS 7 INSTALLATION


[Done](#) us

**Device Selection**

Select the device(s) you'd like to install to. They will be left untouched until you click on the main menu's "Begin Installation" button.

**Local Standard Disks**

34.81 GB



VMware, VMware Virtual S

sda / 34.81 GB free

*Disks left unselected here will not be touched.*

**Specialized & Network Disks**

[Add a disk...](#)

*Disks left unselected here will not be touched.*

**Other Storage Options**

**Partitioning**

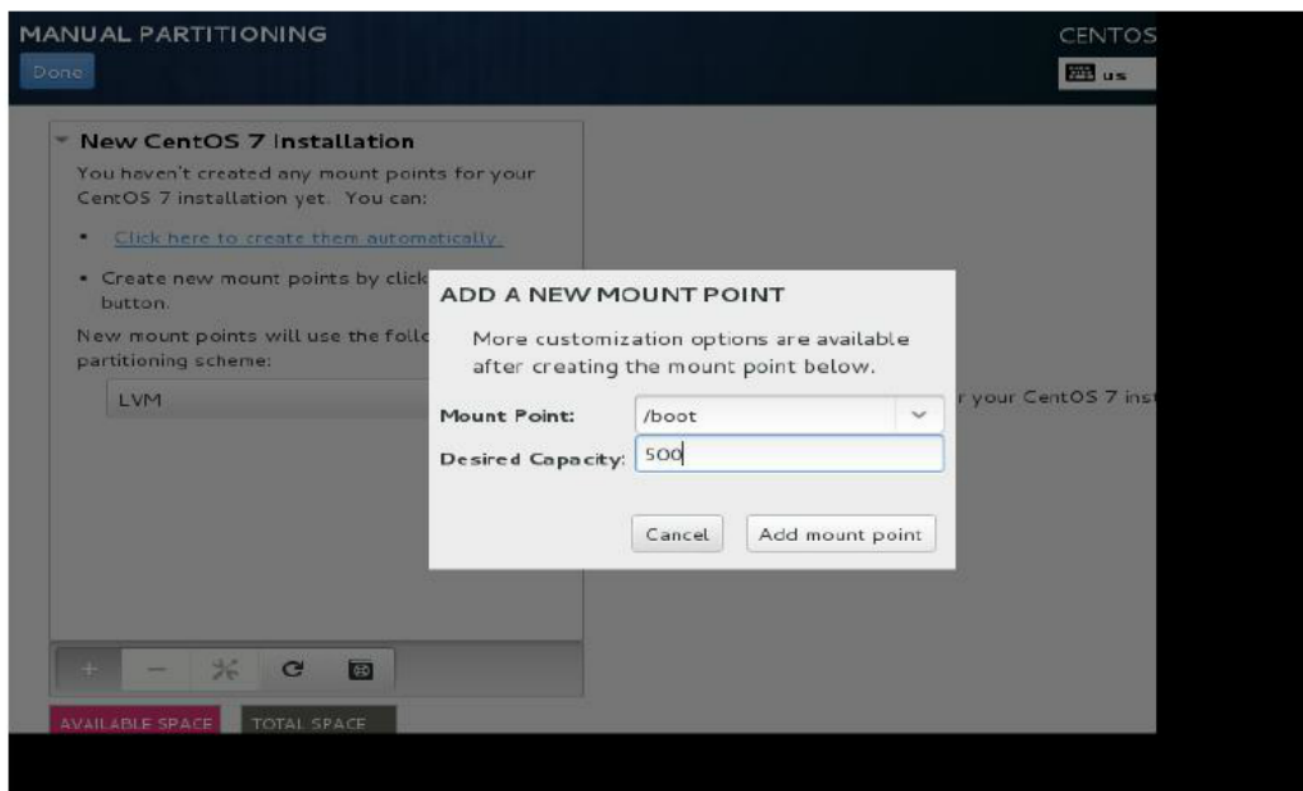
☐ Automatically configure partitioning. ☒ I will configure partitioning.

[Full disk summary and bootloader...](#)

1 disk selected; 34.81 GB capacity; 34.81 GB free

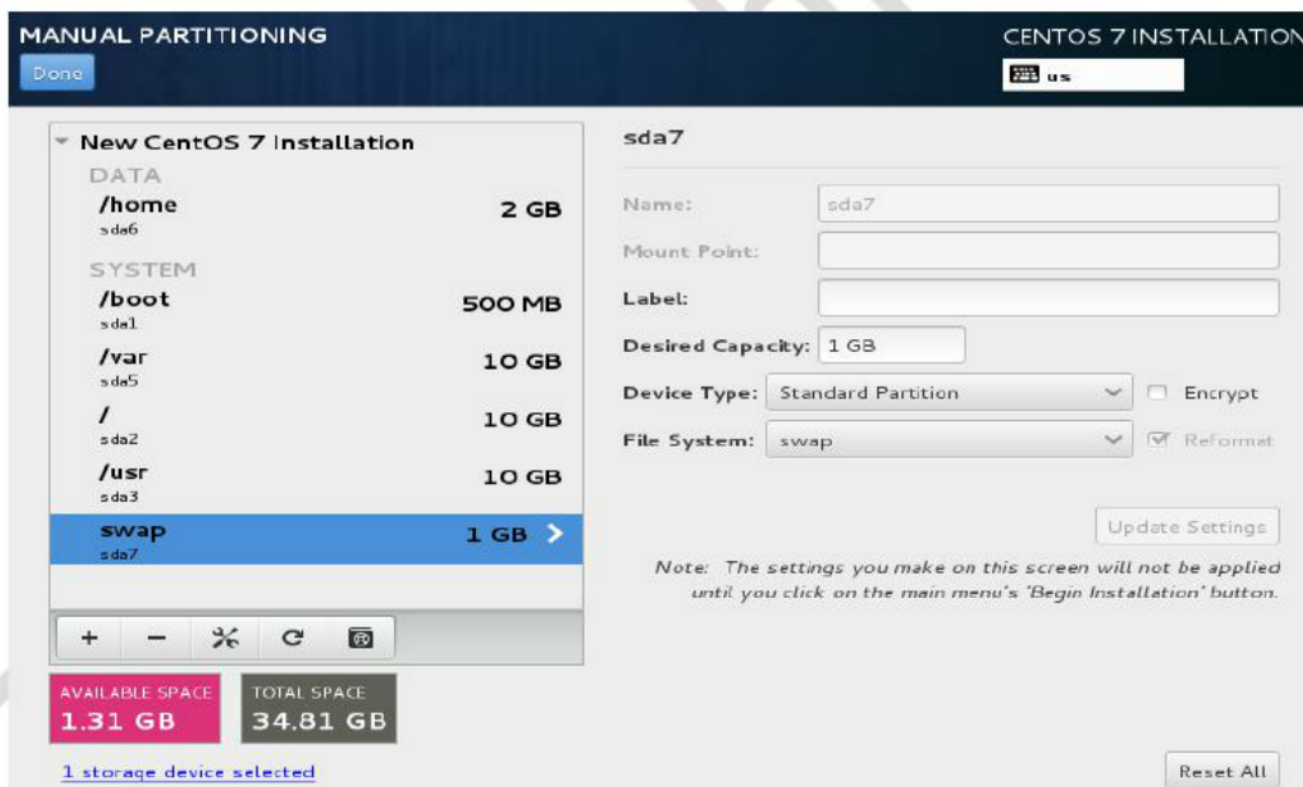


14. Provide **size, mount point** and click next

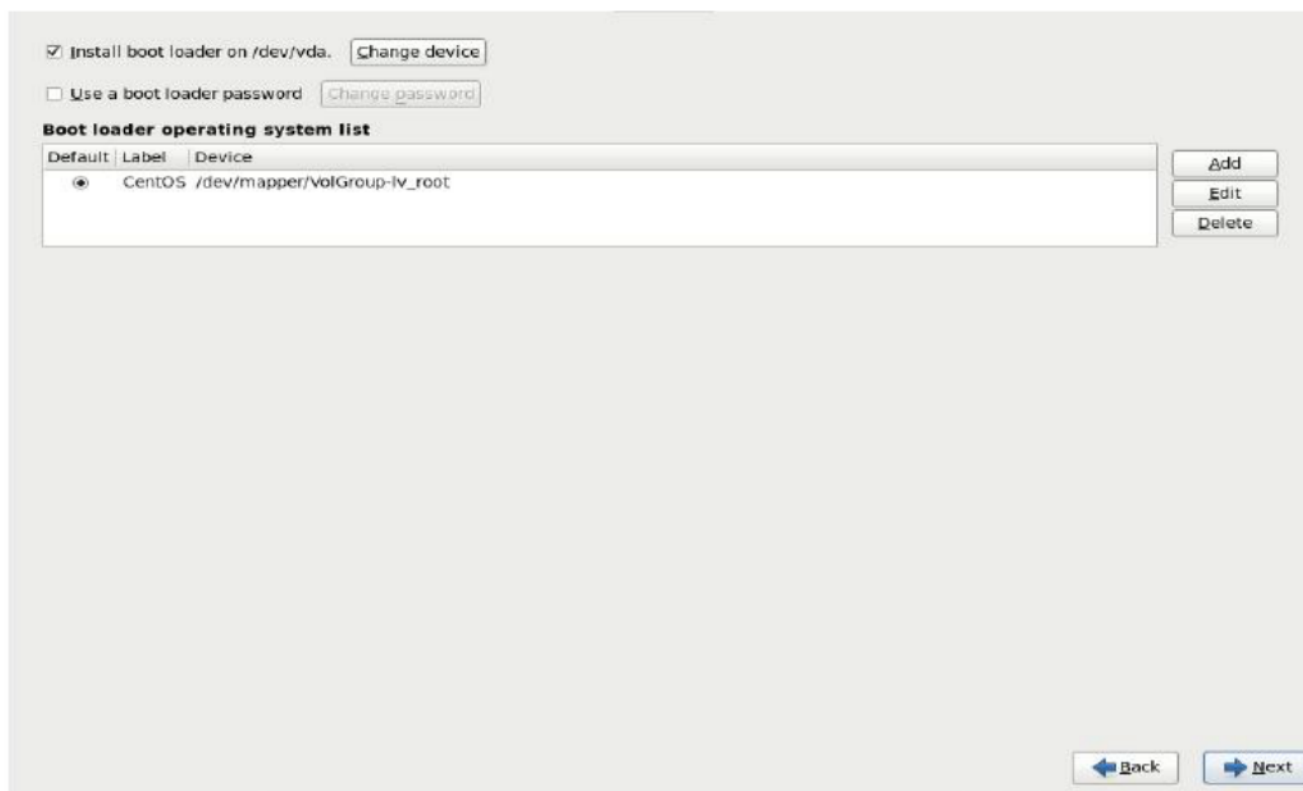


**Note:** Follow the same procedure for all the other partitions required.

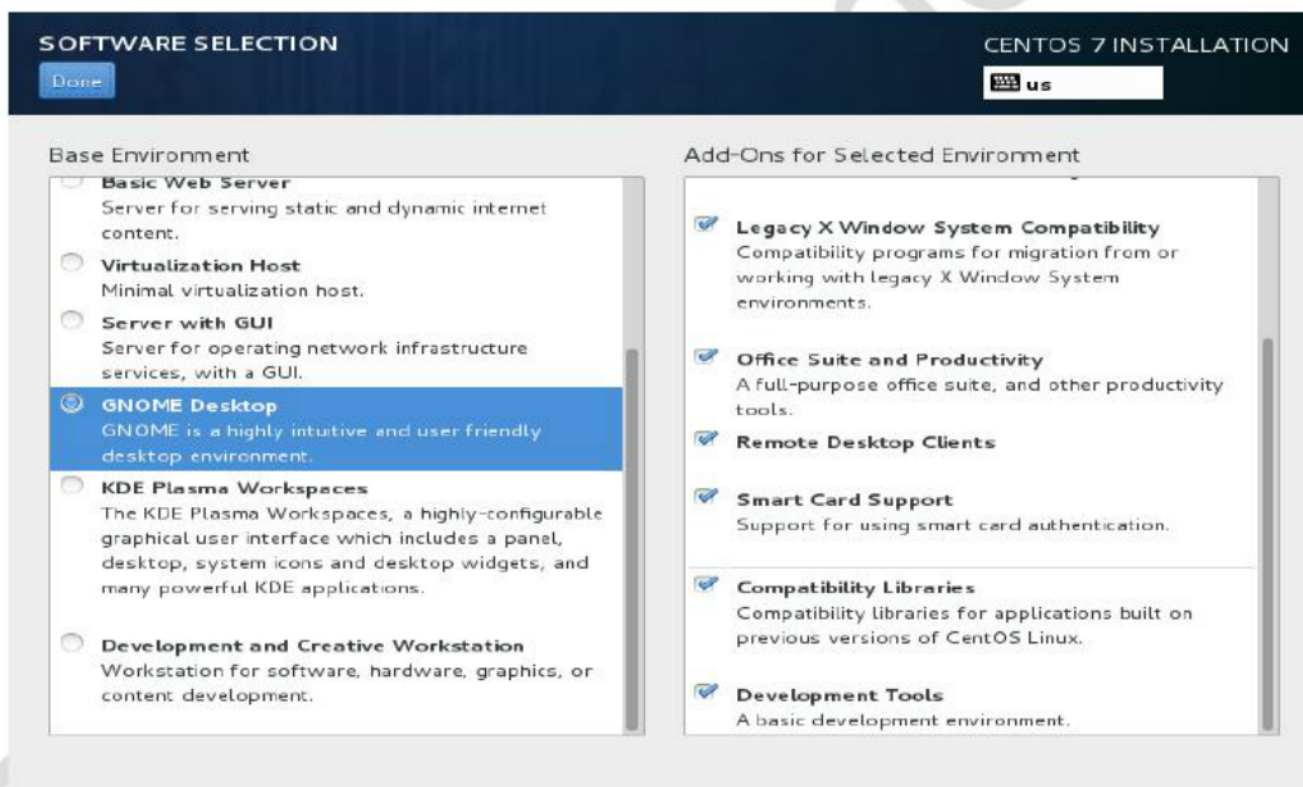
15. After creating all **partitions**, the result is:



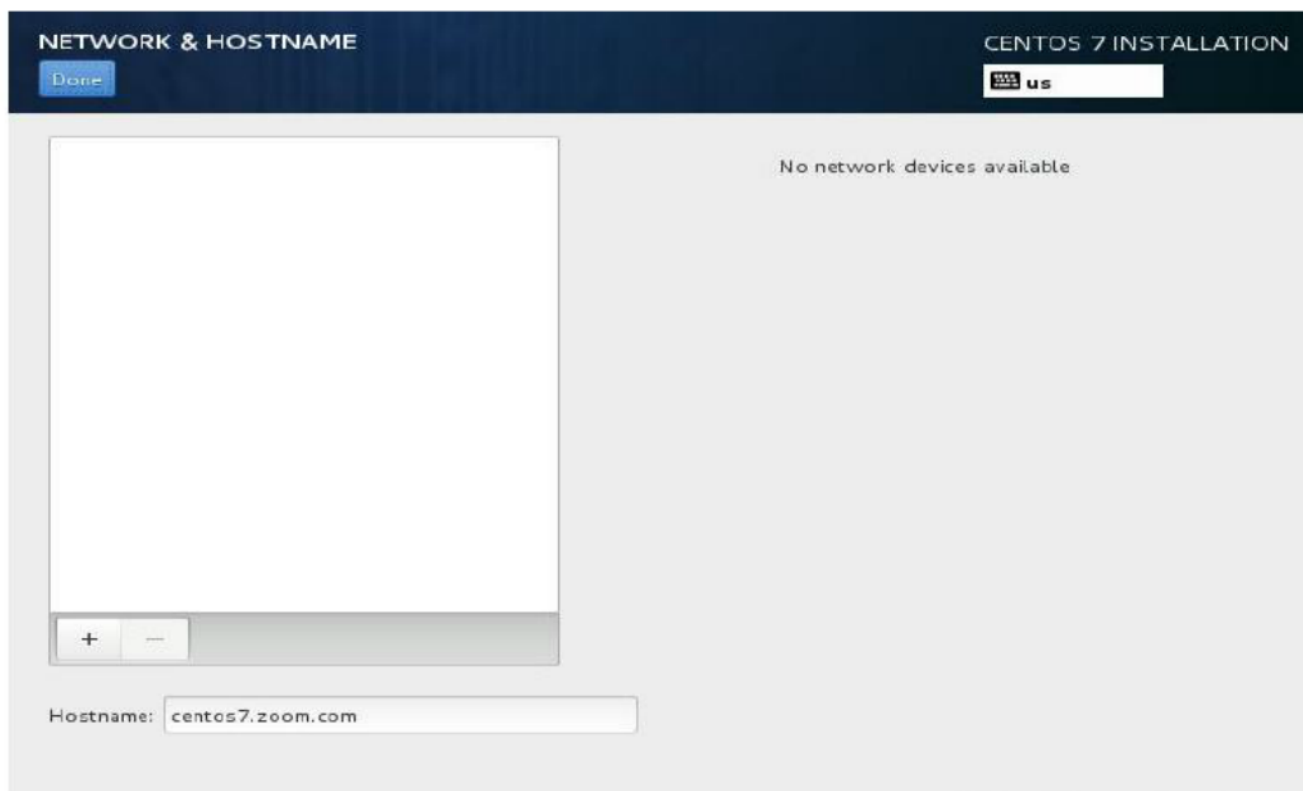
16. Click next to install **bootloader**



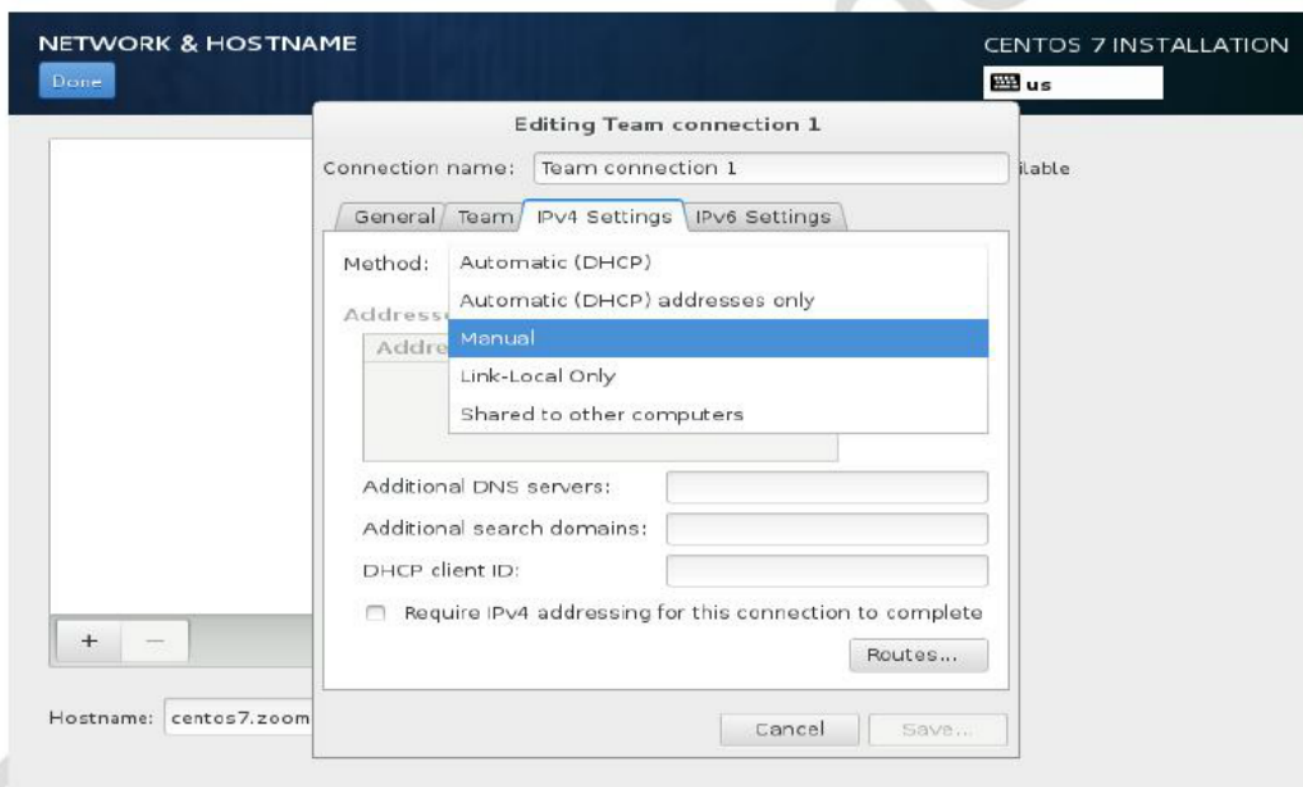
17. Select **GNOME Desktop** and choose applications to install.



## 18. Configure Hostname

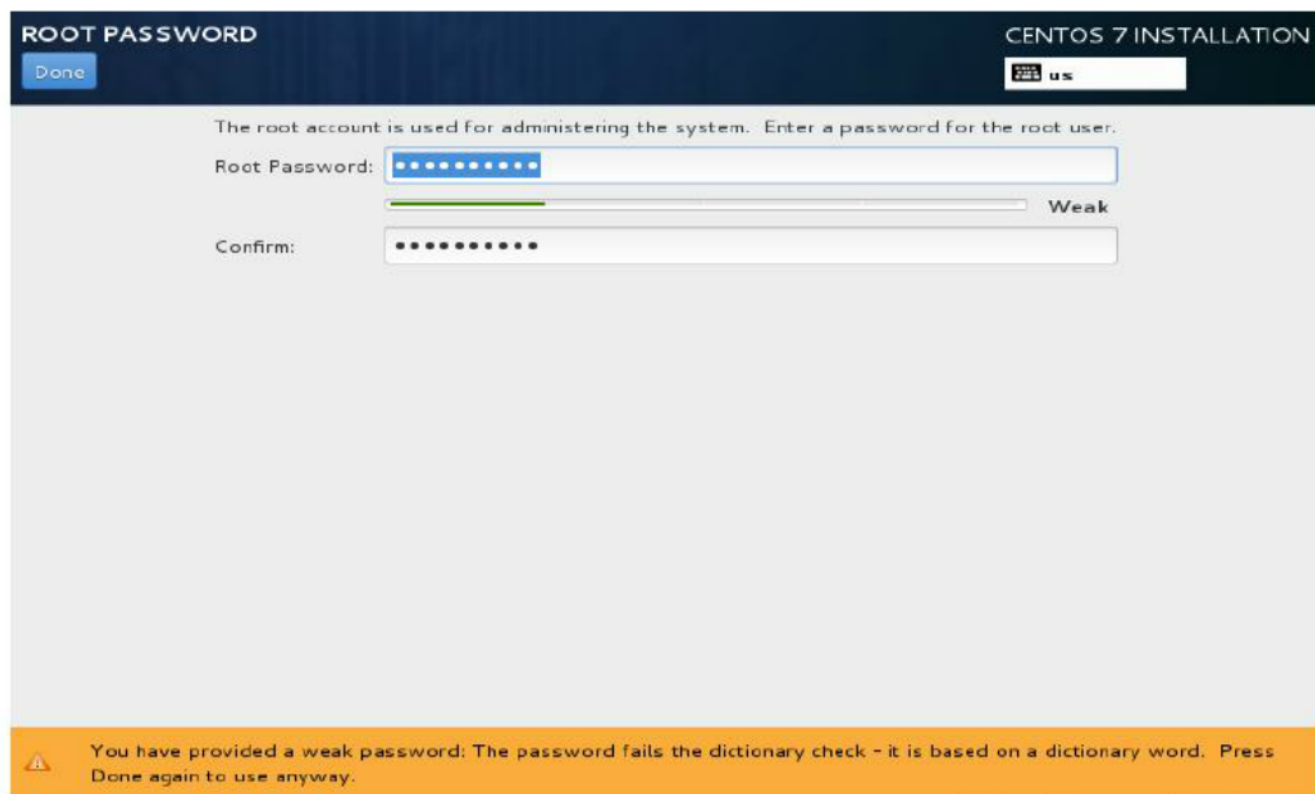


## 19. Provide an IP-Address



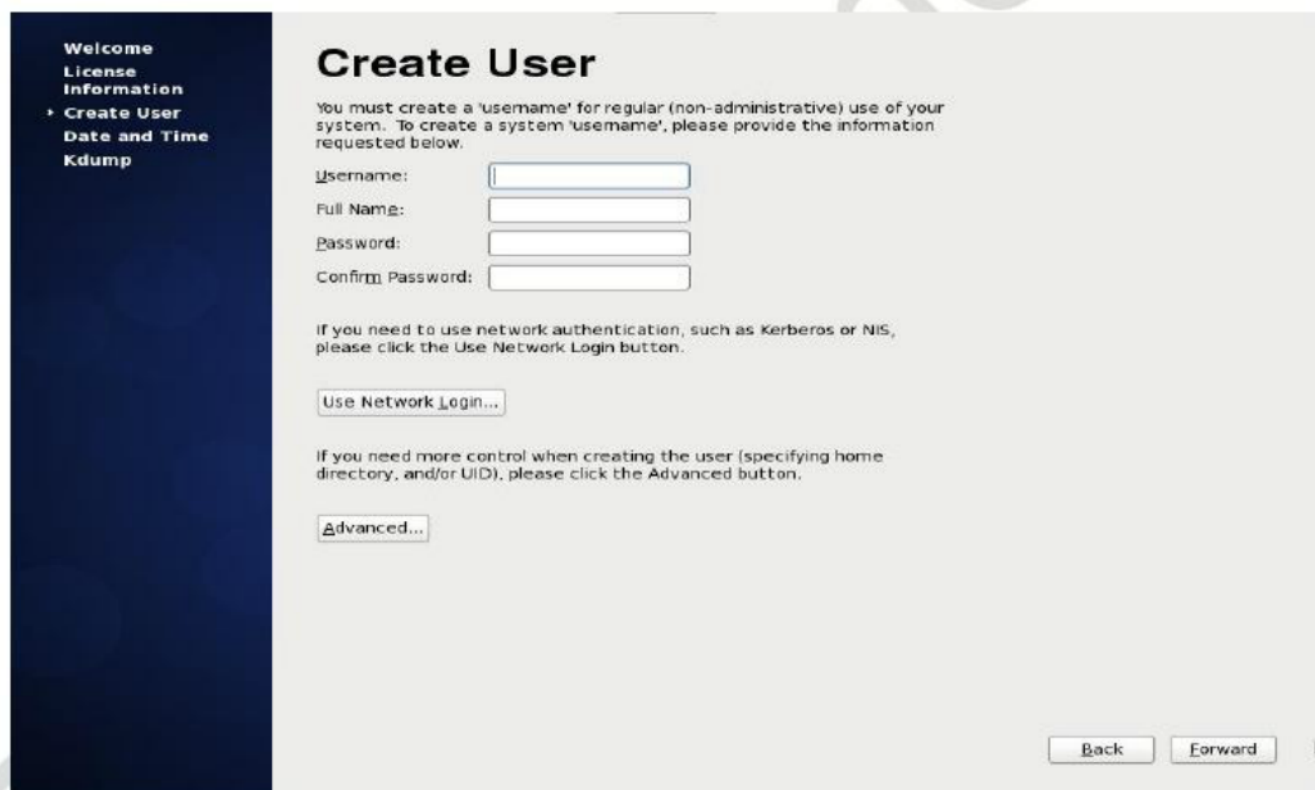


20. Provide a **root password** and click **forward**



The screenshot shows the 'ROOT PASSWORD' screen in the CentOS 7 installation process. The title bar includes 'ROOT PASSWORD' and 'CENTOS 7 INSTALLATION'. A 'Done' button is in the top left. The main text states: 'The root account is used for administering the system. Enter a password for the root user.' Below this are two password input fields: 'Root Password:' and 'Confirm:'. The 'Root Password' field has a strength indicator bar that is mostly green but ends with a red section labeled 'Weak'. An orange warning banner at the bottom reads: 'You have provided a weak password: The password fails the dictionary check - it is based on a dictionary word. Press Done again to use anyway.'

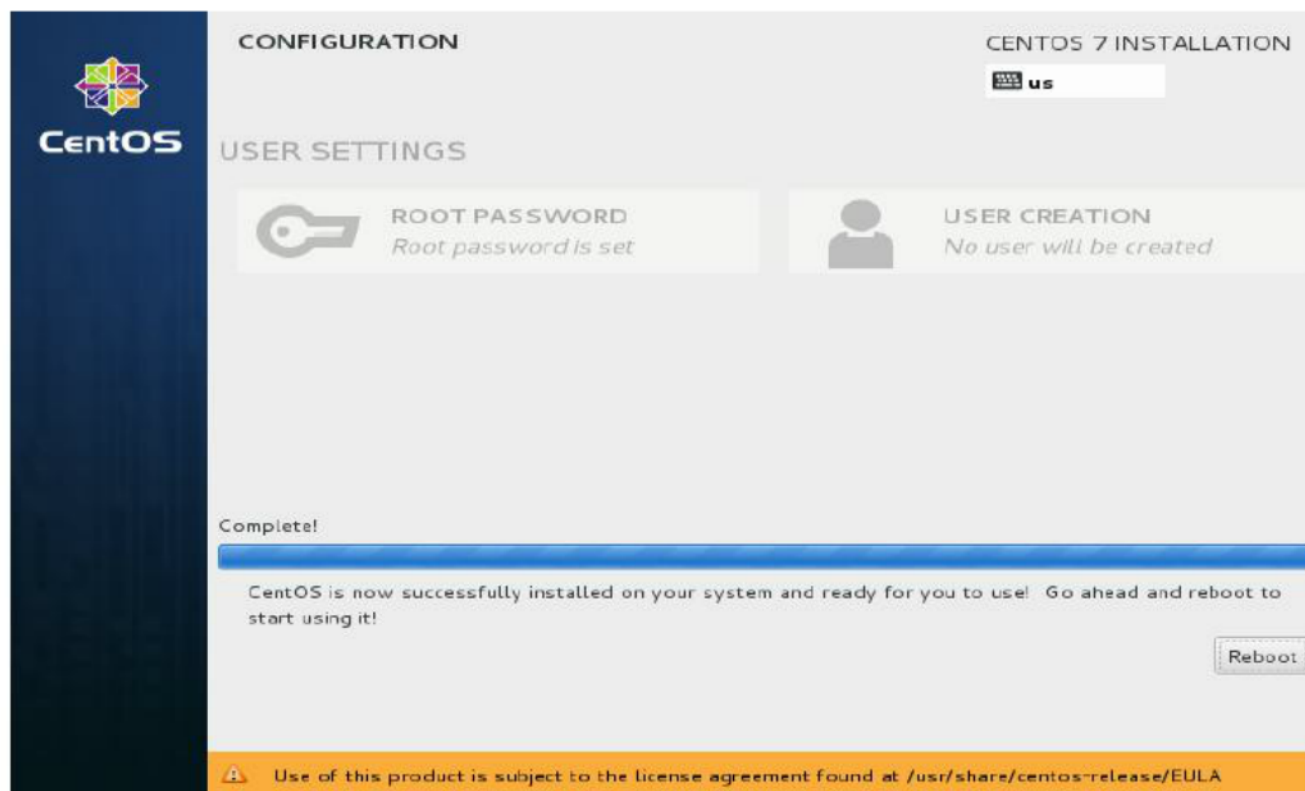
21. Create a non-root user and click **forward**



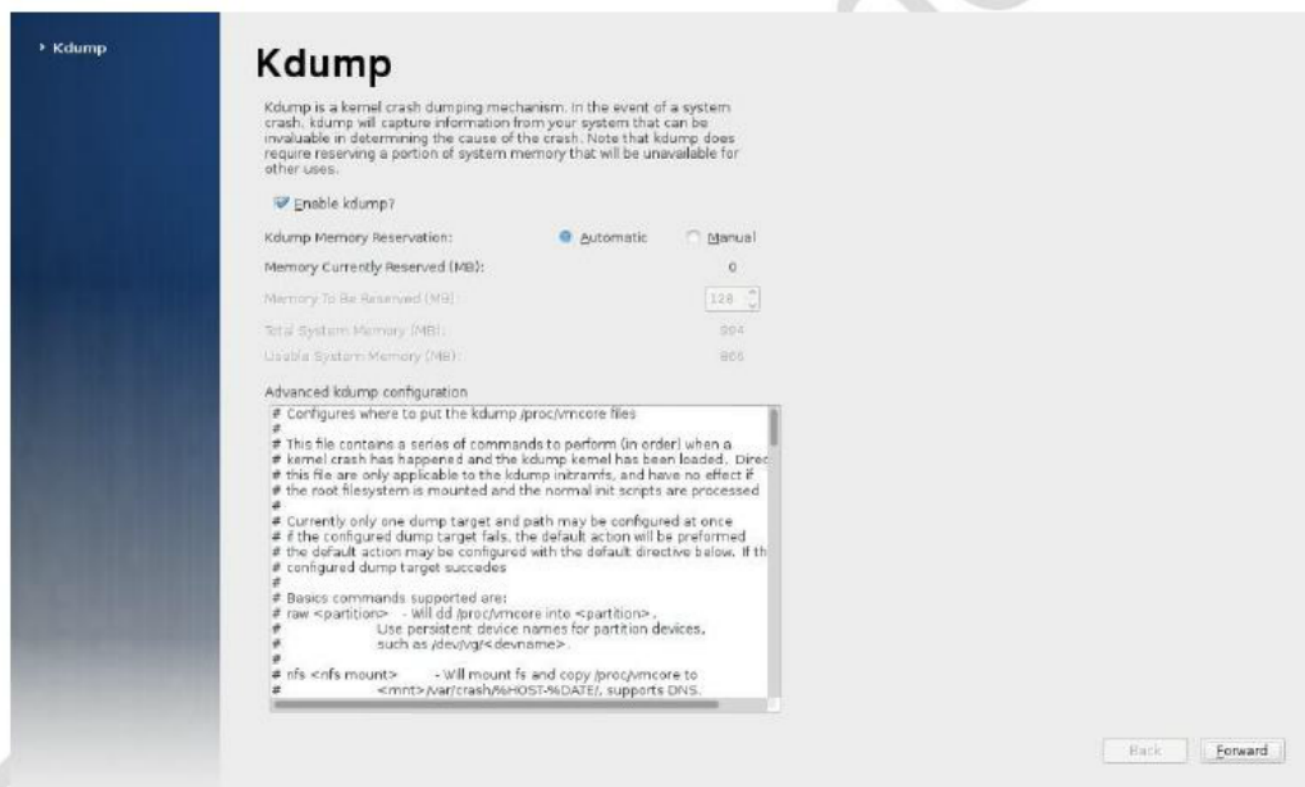
The screenshot shows the 'Create User' screen in the CentOS 7 installation process. On the left is a dark blue sidebar with a menu: 'Welcome', 'License Information', 'Create User' (highlighted), 'Date and Time', and 'Kdump'. The main area is titled 'Create User' and contains the following text: 'You must create a 'username' for regular (non-administrative) use of your system. To create a system 'username', please provide the information requested below.' Below this are four input fields: 'Username:', 'Full Name:', 'Password:', and 'Confirm Password:'. Further down, it says: 'If you need to use network authentication, such as Kerberos or NIS, please click the Use Network Login button.' with a 'Use Network Login...' button. Below that, it says: 'If you need more control when creating the user (specifying home directory, and/or UID), please click the Advanced button.' with an 'Advanced...' button. At the bottom right are 'Back' and 'Forward' buttons.



## 22. The Installation process will take place



## 23. Select forward and finish

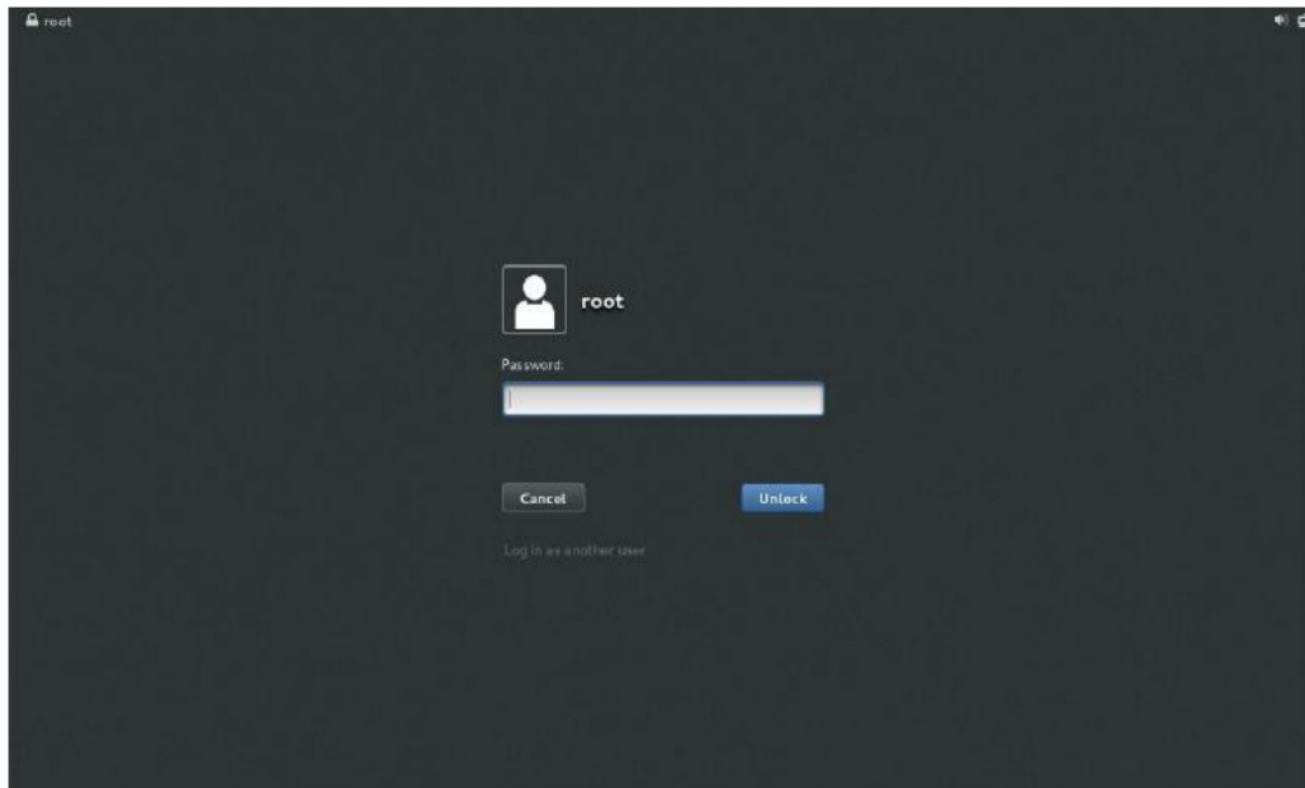


24. Select **Not listed** option

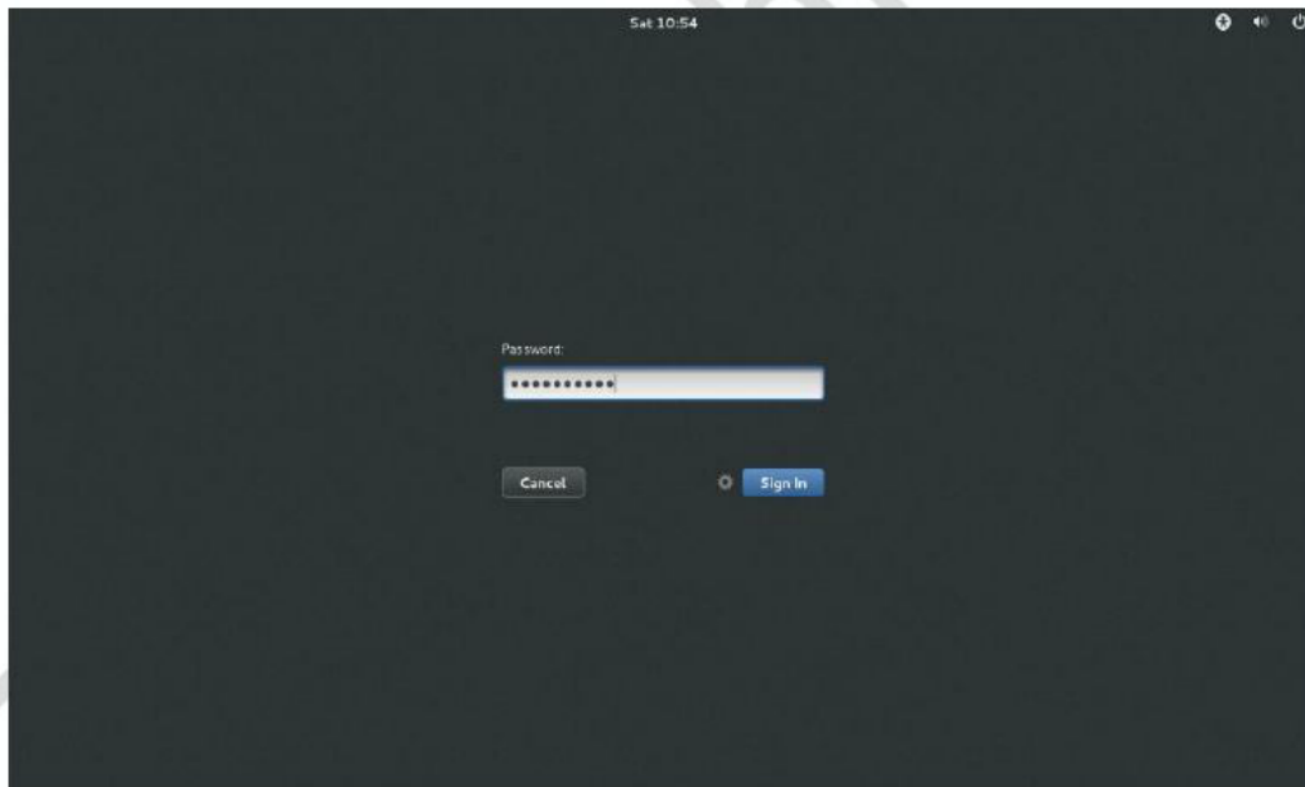


## Verification

- Provide username e.g. **root**



- Provide **password** e.g. zoom\_123





## LAB 2: BASIC COMMANDS -I

**OBJECTIVE:**

To operate the Linux Operating System using basic commands

**PRE-REQUISITE:**

Make sure you have a machine with Linux OS.

**TOPOLOGY:**

1. To check the present working directory

**Syntax:**

```
[root@localhost ~]# pwd
```

```
[root@localhost ~]# pwd
```

**Result:**

```
/root
```

2. To see the list of files and directories(the current directory by default)

**Syntax:**

```
[root@localhost ~]# ls <option>
```

```
[root@localhost ~]# ls
```

**Result:**

```
anaconda-ks.cfg Desktop Documents Downloads initial-setup-ks.cfg Music Pictures Public  
Templates Videos
```

3. To see the long list (properties) of files and directories

```
[root@localhost ~]# ls -l
```

**Result:**

```
total 76  
  
-rw-----. 1 root root 1805 Aug 18 06:31 anaconda-ks.cfg  
-rw-----. 1 root root 8605696 Aug 30 22:56 core.5864  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Desktop  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Documents  
drwxr-xr-x. 2 root root 4096 Aug 21 14:29 Downloads  
-rw-r--r--. 1 root root 1856 Aug 20 09:31 initial-setup-ks.cfg  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Music  
drwxr-xr-x. 2 root root 4096 Aug 21 14:29 Pictures  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Public  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Templates  
drwxr-xr-x. 2 root root 4096 Aug 21 14:16 Videos
```

#### OR ####



```
[root@localhost ~]# ll
```

**Result:**

```
total 7624
-rw-----. 1 root root  1805 Aug 18 06:31 anaconda-ks.cfg
-rw-----. 1 root root 8605696 Aug 30 22:56 core.5864
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Desktop
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Documents
drwxr-xr-x. 2 root root  4096 Aug 21 14:29 Downloads
-rw-r--r--. 1 root root  1856 Aug 20 09:31 initial-setup-ks.cfg
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Music
drwxr-xr-x. 2 root root  4096 Aug 21 14:29 Pictures
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Public
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Templates
drwxr-xr-x. 2 root root  4096 Aug 21 14:16 Videos
```

4. To see the list of files/folders including hidden also.

```
[root@localhost ~]# ls -a
```

**Result:**

```
.          .bash_history .bashrc core.5864 Desktop .esd_auth      .local  Pictures .tcshrc
..         .bash_logout .cache  .cshrc  Documents .ICEauthority .mozilla Public
anaconda-ks.cfg .bash_profile .config .dbus   Downloads initial-setup-ks.cfg Music  Videos
Templates
```

5. To see a file starting from letter D\*

```
[root@localhost ~]# ls D*
```

**Result:**

```
Desktop Downloads Documents
```

6. To see a file or folder whose length is of 6 characters, where ? is used to match any single character

```
[root@localhost ~]# ls -d ??????
```

**Result:**

```
Public Videos
```



## 7. To create a text file by using cat command

### Syntax:

```
[root@localhost ~]# cat > <filename>
```

```
[root@localhost ~]# cat > file1
```

hi how are you, how is your Linux sessions

**ctrl+d (to save)**

## 8. To see an existing file contents

### Syntax:

```
[root@localhost ~]# cat <filename>
```

```
[root@localhost ~]# cat file1
```

### Result

hi how are you, how is your Linux sessions

## 9. To append an existing file

### Syntax:

```
[root@localhost ~]# cat >> <filename>
```

```
[root@localhost ~]# cat >> file1
```

They are good

**Ctrl+d (to save)**

### Verification:

```
[root@localhost ~]# cat file1
```

hi how are you, how is your Linux sessions

They are good



## 10. To create files by using touch command

### Syntax:

```
[root@localhost ~]# touch <file_1> <file_2> ..... <file_n>
```

```
[root@localhost ~]# touch CCIE CCNP CCNA "Advanced Linux"
```

### Verification:

```
[root@localhost ~]# ls
```

```
Advanced Linux anaconda-ks.cfg CCIE CCNP CCNA Desktop Downloads Documents initial-  
setup-ks.cfg Templates Music Public Pictures Videos
```

## 11. Creating a single directory

### Syntax:

```
[root@localhost ~]# mkdir <directory name>
```

```
[root@localhost ~]# mkdir zoomgroup
```

### Verification:

```
[root@localhost ~]# ls
```

```
Advanced Linux anaconda-ks.cfg CCIE CCNP CCNA Desktop Downloads Documents initial-  
setup-ks.cfg Templates Music Public Pictures Videos zoomgroup
```

## 12. Creating multiple directories

### Syntax:

```
[root@localhost ~]# mkdir <dir_1> <dir_2> ... <dir_n>
```

```
[root@localhost ~]# mkdir linux mcse "Ethical Hacking"
```

### Verification:

```
[root@localhost ~]# ls
```

```
Advanced Linux anaconda-ks.cfg CCIE CCNP CCNA Desktop Downloads Documents  
Ethical Hacking initial-setup-ks.cfg linux Templates mcse Music Public Pictures Videos  
zoomgroup
```





**13. To create nested directory along with child directories****Syntax:**

```
[root@localhost ~]# mkdir -p <dir1>/<dir2>/<dir3>/<dir4>/<dir5>/<dir6>  
-p (parent directory)
```

```
[root@localhost ~]# mkdir -p linuxtech/clusters/san/ldap/nagios/samba
```

**14. To see the tree structure**

```
[root@localhost ~]# ls -R linuxtech
```

**Result:**

```
linuxtech:  
clusters
```

```
linuxtech/clusters:  
san
```

```
linuxtech/clusters/san:  
ldap
```

```
linuxtech/clusters/san/ldap:  
nagios
```

```
linuxtech/clusters/san/ldap/nagios:  
samba
```

```
linuxtech/clusters/san/ldap/nagios/samba:
```

**15. To change a directory (Navigation between Directories)****Syntax:**

```
[root@localhost ~]# cd <dir_1>/<dir_2>...../<dir_n>
```

```
[root@localhost ~]# cd linuxtech/clusters/san/ldap/nagios/samba
```

**Verification:**

```
[root@localhost samba]# pwd  
/root/linuxtech/clusters/san/ldap/nagios/samba
```



**16. To move 1 step back**

```
[root@localhost samba]# cd ..
```

**Verification:**

```
[root@localhost nagios]# pwd  
  
/root/linuxtech/clusters/san/ldap/nagios
```

**17. To move 2 steps back**

```
[root@localhost nagios]# cd ../../
```

**Verification:**

```
[root@localhost san]# pwd  
  
/root/linuxtech/clusters/san
```

**18. To go directly to user home directory**

```
[root@localhost san]# cd
```

**Verification:**

```
[root@localhost ~]# pwd  
  
/root
```

**19. To go to last working directory**

```
[root@localhost ~]# cd -
```

**Result:**

```
/root/linuxtech/clusters/san
```

**Verification:**

```
[root@localhost san]# pwd  
  
/root/linuxtech/clusters/san
```



## 20. To remove files

### Syntax:

```
[root@localhost ~]# rm <filename>
```

```
[root@localhost san]# cd
```

```
[root@localhost ~]# rm "Advanced Linux"
```

```
rm: remove regular empty file `Advanced Linux'? y
```

### Verification

```
[root@localhost ~]# ls
```

```
anaconda-ks.cfg  CCIE CCNP CCNA Desktop Downloads Documents  
Ethical Hacking initial-setup-ks.cfg linuxtech linux Templates mcse Music Public Pictures  
Videos zoomgroup
```

### Note:

Deleted **Advanced Linux** file cannot be displayed.

## 21. To remove an empty directory

### Syntax:

```
[root@localhost ~]# rmdir <directory name>
```

```
[root@localhost ~]# rmdir linux
```

### Verification :

```
[root@localhost ~]# ls
```

```
anaconda-ks.cfg  CCIE CCNP CCNA Desktop Downloads Documents  
Ethical Hacking initial-setup-ks.cfg linuxtech Templates mcse Music Public Pictures Videos  
zoomgroup
```

### Note:

Deleted **linux** directory cannot be displayed



**22. To remove a directory along with all sub directories and files forcefully****Syntax:**

```
[root@localhost ~]# rm -rf <dir_name>
```

```
[root@localhost~]# rm -rf linuxtech
```

**Verification:**

```
[root@localhost ~]# ls
```

```
anaconda-ks.cfg  CCIE CCNP CCNA Desktop Downloads Documents
```

```
Ethical Hacking initial-setup-ks.cfg Templates mcse Music Public Pictures Videos zoomgroup
```

**Note:**

Deleted `linuxtech` directory cannot be displayed



## LAB 3: BASIC COMMANDS II

**OBJECTIVE:**

To operate the Linux Operating System using basic commands like copy, paste, move, etc.

**PRE-REQUISITE:**

Linux machine with VI editor

**TOPOLOGY:**



### 1. To copy file data from one file to another

#### Syntax:

```
[root@localhost ~]# cp <source_file> <destination_file>
```

```
[root@localhost ~]# cp anaconda-ks.cfg file1
```

### 2. To verify that the data has been copied

```
[root@localhost ~]# cat file1
```

#### Result:

```
# System authorization information
auth --enableshadow --passalgo=sha512
```

```
# Use CDROM installation media cdrom
# Run the Setup Agent on first boot
firstboot --enable
ignoredisk --only-use=sda
# Keyboard layouts
keyboard --vckeymap=us --xlayouts='us'
# System language
lang en_US.UTF-8
```

### 3. To copy folders

#### Syntax:

```
[root@localhost ~]# cp <options> <source_dir> <destination_dir>
```

-r (recursive)

-v (verbose)

-p (permissions)

```
[root@localhost ~]# cp -rvp mcse Desktop
```

#### Result:

```
'mcse' -> 'Desktop/mcse'
```

#### Verification:

```
[root@localhost ~]# ls Desktop
mcse
```



#### 4. To rename directories and files

##### Syntax:

```
[root@localhost ~]# mv <source_name> <new_name>
```

```
[root@localhost ~]# mv zoomgroup zoomtech
```

##### Verification

```
[root@localhost ~]# ls
```

```
anaconda-ks.cfg  CCIE CCNP CCNA Desktop Downloads Documents
```

```
Ethical Hacking initial-setup-ks.cfg Templates mcse Music Public Pictures Videos zoomtech
```

#### 5. To move directories and files

##### Syntax:

```
[root@localhost ~]# mv <source_file/folder> <destination_dir>
```

```
[root@localhost ~]# mv /root/CCNA /opt
```

##### Verification

```
[root@localhost ~]# ls /opt
```

```
CCNA
```

#### 6. To filter the single word from a file

##### Syntax:

```
[root@localhost ~]# grep <string> <file_name>
```

```
[root@localhost ~]# grep root /etc/passwd
```

##### Verification

```
/etc/passwd:root:x:0:0:root:/root:/bin/bash
```

#### 7. To see the type of file

```
[root@localhost ~]# file *
```

##### Verification

##### NameType

Desktop	Directory
anaconda.cfg	ASCII text
file1	ASCII text



CCIE                      Empty

**8. To view and change the date and time**

**Syntax:**

```
[root@localhost ~]# date -s " Day/mm/dd/hh:mm:ss/year"
-s ( string )
```

```
[root@localhost ~]# date
```

**Result:**

```
fri Aug 14 10:10:10 ist 2015
```

```
[root@localhost ~]# date -s "sat Aug 15 10:20:10 ist 2015"
```

**Verification:**

```
Day/mm/dd/hh:mm:ss/year
```

```
sat Aug 15 10:20:10 ist 2015
```

**9. To view the calendar for complete year in screen order**

```
[root@localhost ~]# cal 2015 | less
```

```
## OR ##
```

```
[root@localhost ~]# cal 2015 | more
```

**Note:** use **q** option to quit from screen order mode

**10. To get help on a particular command with man**

**Syntax:**

```
[root@localhost ~]# man <command_name>
```

```
[root@localhost ~]# man mkdir
```

Note: use **q** option to quit from man page

**11. To find the location of an object**

**Syntax:**

```
[root@localhost ~]# find <source_dir> <options> <searching_file/folder>
```

```
-iname case insensitive
```



```
[root@localhost ~]# find / -iname anaconda-ks.cfg
```

**Result:**

```
/root/anaconda-ks.cfg
```

**12. To count words, lines and characters of file**

**Syntax:**

```
[root@localhost ~]# wc <filename>
```

```
[root@localhost ~]# wc anaconda-ks.cfg
```

**Result:**

```
66 154 1805 anaconda-ks.cfg
```



## LAB 4: VISUAL INTERFACE (VI EDITOR)

**OBJECTIVE:**

To create, edit and modify text files with VI editor

**PRE-REQUISITE:**

Linux machine with VI editor

**TOPOLOGY:**



## 1. Modify the file by using vi command

### Syntax:

```
[root@localhost~]# vi <filename>
```

```
[root@localhost~]# vi zoomfile
```

## 2. Commands to go from command mode to insert mode

- i - inserts the text at current cursor position
- I - inserts the text at beginning of line
- a - appends the text after current cursor
- A - appends the text at end of line
- o - inserts a line below current cursor
- O - inserts a line above current cursor
- r - replace a single char at current cursor

## 3. Commands in execute mode

- :q - quit without saving
- :q! - quit forcefully without saving
- :w - save
- :wq - save and quit
- :wq! - save and quit forcefully
- :x - save and quit
- :sh - Provides temporary shell
- :se nu - Setting line numbers
- :se nonu - Removing line numbers
- :84 - Press enter goes to line

## 4. To find and replace words

- 1,\$s/<findword>/<replaceword>/gc
- :1,\$s/world/universe/gc
- 1-- To start the search at from 1st line
- \$ -> End of File
- s -> substitute
- g -> global
- c -> confirmation



## 5. Commands in command mode

dd - Deletes a line  
2dd - Deletes 2 lines  
yy - Copy a line  
2yy - Copies 2 lines  
p - put (deleted or copied text)  
u - Undo (can undo 1000 times)  
Ctrl+r - Redo  
G - Moves cursor to last line of file  
5G - Moves cursor to 5th line of file  
Shift+ZZ - save and quit  
/<find word> - locate word



## LAB 5: USER ADMINISTRATION

**OBJECTIVE:**

To create a new user, modify and delete user accounts

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

### 1. Adding a new user

**Syntax:**

```
[root@localhost~]# useradd <username>
```

```
[root@localhost~]# useradd Tom
```

### 2. To filter single user properties

```
[root@localhost~]# grep Tom /etc/passwd
```

**Result:**

```
Tom:x:1000:1000:/home/Tom:/bin/bash
```

### 3. To check last 10 lines of /etc/passwd

```
[root@localhost ~]# tail /etc/passwd
```

**Result:**

```
rtkit:x:172:172:RealtimeKit:/proc:/sbin/nologin
radvd:x:75:75:radvd user:/:/sbin/nologin
chrony:x:994:993::/var/lib/chrony:/sbin/nologin
pulse:x:171:171:PulseAudio System Daemon:/var/run/pulse:/sbin/nologin
gdm:x:42:42::/var/lib/gdm:/sbin/nologin
gnome-initial-setup:x:993:991::/run/gnome-initial-setup:/sbin/nologin
postfix:x:89:89::/var/spool/postfix:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
tcpdump:x:72:72::/sbin/nologin
Tom:x:1000:1000::/home/Tom:/bin/bash
```

### 4. To check top 10 lines of user's file

```
[root@localhost ~]# head /etc/passwd
```

**Result:**

```
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/sbin/nologin
daemon:x:2:2:daemon:/sbin:/sbin/nologin
adm:x:3:4:adm:/var/adm:/sbin/nologin
lp:x:4:7:lp:/var/spool/lpd:/sbin/nologin
sync:x:5:0:sync:/sbin:/bin/sync
shutdown:x:6:0:shutdown:/sbin:/sbin/shutdown
halt:x:7:0:halt:/sbin:/sbin/halt
mail:x:8:12:mail:/var/spool/mail:/sbin/nologin
operator:x:11:0:operator:/root:/sbin/nologin
```



5. To assign password on Tom user

**Syntax:**

```
[root@localhost ~]# passwd <username>
```

```
[root@localhost ~]# passwd Tom
```

Changing password for user Tom.

New password:

BAD PASSWORD: The password is shorter than 8 characters

Retype new password:

passwd: all authentication tokens updated successfully.

6. To check password properties of Tom user

```
[root@localhost ~]# grep Tom /etc/shadow
```

**Result:**

```
Tom:$6$IWiNPPn9$uBA.bikWM0G7Z/VI.J0AZoY0zWO7yph.3WzItDx2.urlqEch1xTlOPpWvpEQ5  
RZrm7rVm.1tB6rxhdPy/AWcN1:16677:0:99999:7:::
```





**Verification:**

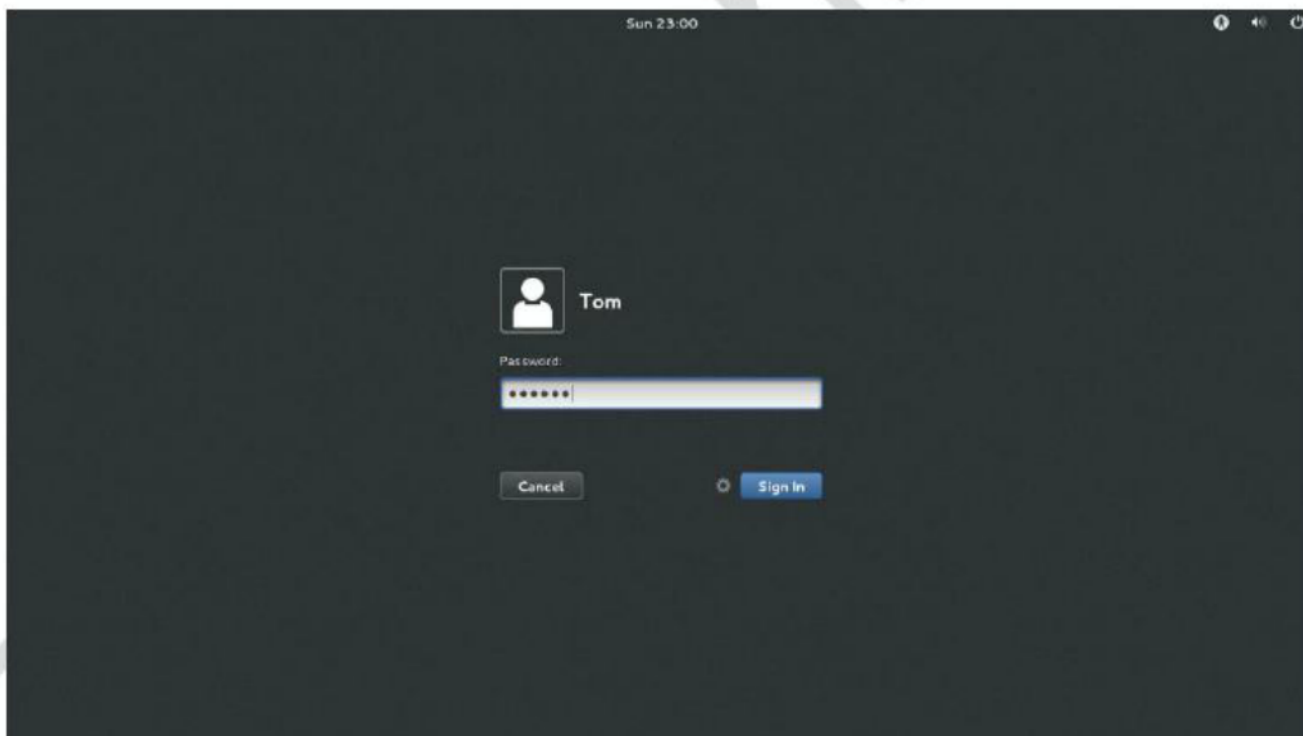
Open another gui console to login with new user

```
[root@localhost ~]# gdmflexiserver
```

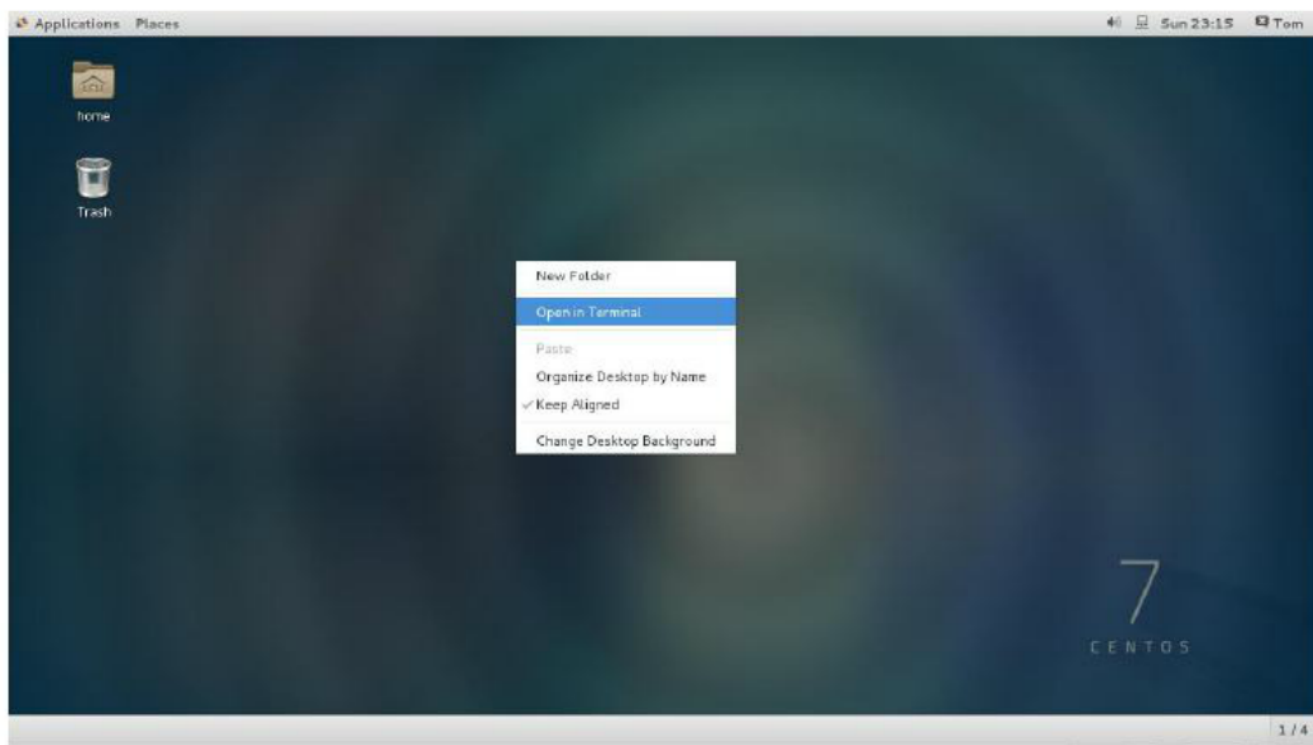
Select **Tom** username



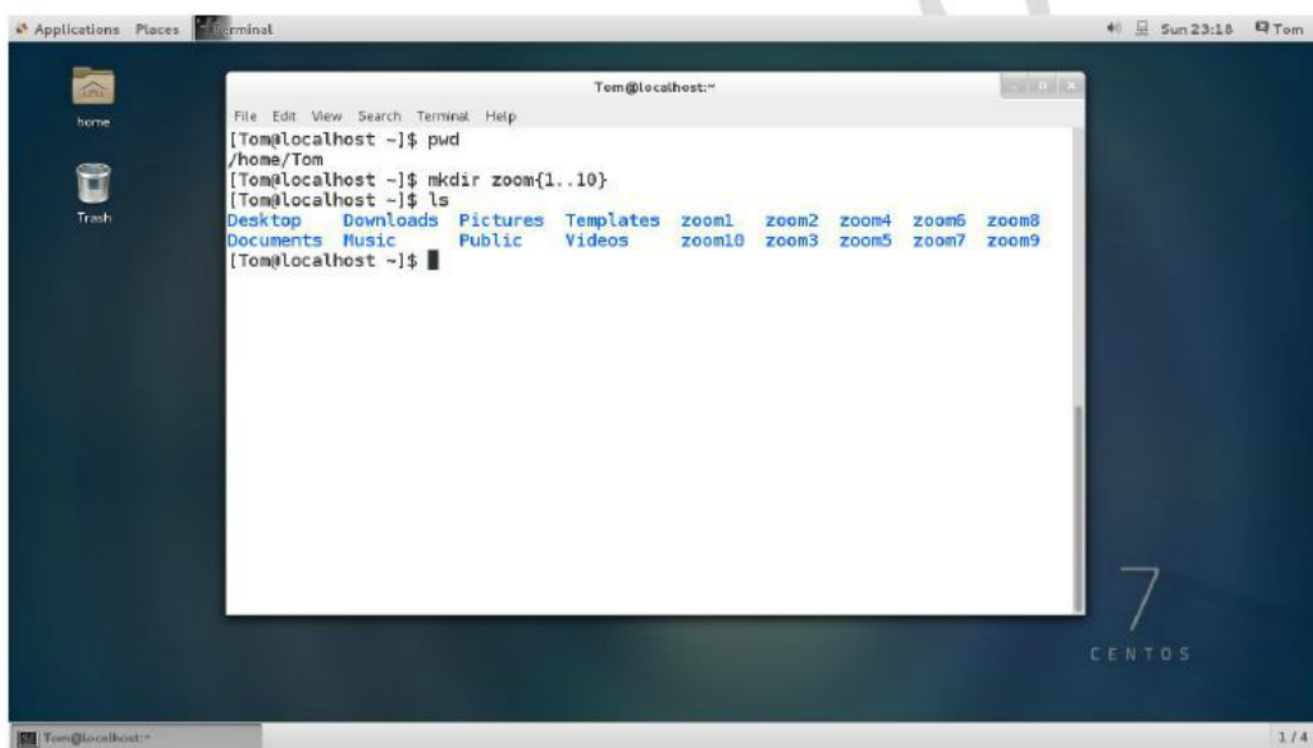
Providing **Tom** password



## Opening a terminal in **Tom** console



## Adding data as a **Tom** user



**Note:** To check Tom user data move to root user console by using **ctrl+alt+f1** and check in his home directory.

### **Verification:**

```
[root@localhost ~]# ls /home/Tom
```

```
Desktop  Downloads Pictures Templates zoom1  zoom2 zoom4 zoom6 zoom8
Documents Music   Public   Videos  zoom10 zoom3 zoom5 zoom7 zoom9
```

## Modifying an existing user's properties

### Syntax:

```
[root@localhost~]# usermod <option> <arguments> <username>
```

- u 2001 (changing user id)
- c "Manager of sales dept" (changing new comment)
- d /salesdept (changing new directory)
- s /bin/csh (changing an user shell)
- l /bin/csh (changing an user login name)
- L /bin/csh (To lock a user account)
- U /bin/csh (To unlock a user account)

### 1. Changing uid of an existing user

#### Syntax:

```
[root@localhost~]# usermod -u <uid> <username>
```

```
[root@localhost~]# usermod -u 2001 Tom
```

#### Verification:

```
[root@localhost~]# grep Tom /etc/passwd
```

```
Tom: x: 2001:1000: /home/Tom:/bin/bash
```

```
[root@localhost~]# su - Tom
```

```
[Tom@localhost~]$ id
```

```
uid=2001(Tom) gid=1001(Tom) groups=1001(Tom)
```

```
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
```

```
[Tom@localhost~]$ exit
```

```
logout
```

### 2. Changing comment of an existing user

#### Syntax:

```
[root@localhost~]# usermod -c <comment> <username>
```

```
[root@localhost~]# usermod -c "Manager of sales dept" Tom
```

#### Verification:

```
[root@localhost~]# grep Tom /etc/passwd
```



Tom: x: 2001:1000: Manager of sales dept:/home/tom:/bin/bash

### 3. Changing user home directory

**Adding new directory according username in an existing directory**

```
[root@localhost~]# mkdir -p /salesdept/Tom
```

#### Syntax:

```
[root@localhost~]# usermod -d <directory> <username>
```

```
[root@localhost~]# usermod -d /salesdept/Tom Tom
```

**Copying bash files from default directory into user home directory**

```
[root@localhost~]# cp -rvp /etc/skel/. /salesdept/Tom
```

#### Verification:

```
[root@localhost~]# grep Tom /etc/passwd
```

Tom:x:2001:1000:"Manager of Sales Dept":/salesdept/Tom:/bin/bash

```
[root@localhost~]# su - Tom
```

```
[Tom@localhost~]$ pwd
```

```
/salesdept/Tom
```

```
[Tom@localhost~]$ exit
```

```
logout
```

### 4. Change an existing user shell

#### Syntax:

```
[root@localhost~]# usermod -s <new shell> <username>
```

```
[root@localhost~]# usermod -s /bin/ksh Tom
```

#### Verification:

```
[root@localhost~]# grep Tom /etc/passwd
```

Tom:x:2001:1000:"Manager of Sales Dept":/Salesdept/Tom:/bin/ksh



```
[root@localhost~]# su – Tom
```

```
$ echo $SHELL
```

```
/bin/ksh
```

```
$ exit
```

```
logout
```

## 5. To change an existing user's login name

### Syntax:

```
[root@localhost ~]# usermod -l <new name> <old name>
```

```
[root@localhost ~]# usermod -l John Tom
```

### Verification:

```
[root@localhost ~]# grep John /etc/passwd
```

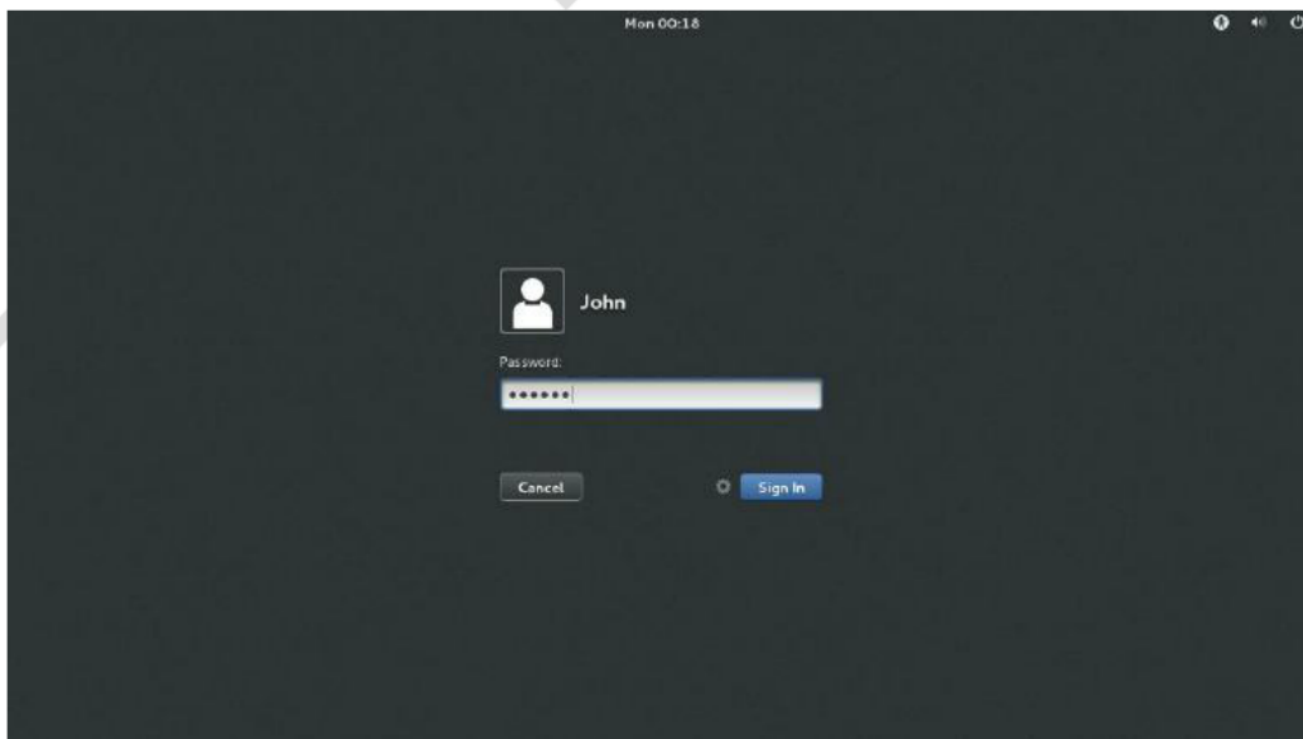
```
John:x:2001:1000:Manager of sales dept:/salesdept/Tom:/bin/ksh
```

**Note:** User home directory will not be changed, only username will change

```
[root@localhost ~]# gdmflexiserver
```

### Result:

User is logging with new name



## 6. To Lock the Account

### Syntax:



```
[root@localhost ~]# usermod -L <username>
```

```
[root@localhost ~]# usermod -L John
```

**Verification:**

```
[root@localhost ~]# grep John /etc/shadow
```

```
John:!!$6$xyIJN65M$iK6FLYNX01DcBfmnc9Ea23MljYdggkdpwMH7qcA3m4ZrP0dgKm1hDqr8Zh  
Y6gkmNy3scVrqazV2DjVvh.JZFL/:16677:0:99999:7:::
```

**Note:** (!) Exclamation mark is a sign of Locked user

```
[root@localhost ~]# gdmflexiserver
```

**Result:**

**Username John** not displayed because that account has been locked



## 7. To Unlock the Account

**Syntax:**

```
[root@localhost ~]# usermod -U <username>
```

```
[root@localhost ~]# usermod -U John
```

**Verification:**

```
[root@localhost ~]# grep John /etc/shadow
```

```
John:$6$xyIJN65M$iK6FLYNX01DcBfmnc9Ea23MljYdggkdpwMH7qcA3m4ZrP0dgKm1hDqr8Zh  
Y6gkmNy3scVrqazV2DjVvh.JZFL/:16677:0:99999:7:::
```

**Note:** (!) Exclamation mark will be removed once the user account is unlocked.



```
[root@localhost ~]# gdmflexiserver
```

**Result:**

**Username John** is displayed and by using that name user John can login



To add new user with all new properties

**Syntax:**

```
[root@localhost~]# useradd -u <uid> -c <comment> -d <newdir> -s <newshell> <username>
```

```
[root@localhost~]# useradd -u 2002 -c "Admin" -d /salesdept/Ali -s /bin/csh Ali
```

**Verification:**

```
[root@localhost~]# grep Ali /etc/passwd
```

```
Ali:x:2002:1003:Admin:/salesdept/Ali:/bin/csh
```

**8. To delete user John without deleting his home directory**

**Syntax:**

```
[root@localhost ~]# userdel <username>
```

```
[root@localhost ~]# userdel John
```

**Verification:**

```
[root@localhost ~]# ls /home
```

**Note:** User directory will not be deleted

```
[root@localhost ~]# grep John /etc/passwd
```

**Result:**

No user properties are shown

**9. To delete user along with his home directory**

**Syntax:**

```
[root@localhost ~]# userdel -r <username>
```

```
[root@localhost ~]# userdel -r Ali
```

**Verification:**

```
[root@localhost ~]# ls /home
```

**Note:** User directory will also be deleted

```
[root@localhost ~]# grep Ali /etc/passwd
```

**Result:**

No user properties are shown



## LAB 6: GROUP ADMINISTRATION

**OBJECTIVE:**

To create a new group and modify an existing group's properties

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

### 1. To add new group

**Syntax:**

```
[root@localhost ~]# groupadd <groupname>
```

```
[root@localhost ~]# groupadd zoomtech
```

**Verification:**

```
[root@localhost ~]# grep zoomtech /etc/group
```

```
zoomtech:x:1000:
```

### 2. To assign password to a group

**Syntax:**

```
[root@localhost ~]# gpasswd <groupname>
```

```
[root@localhost ~]# gpasswd zoomtech
```

Changing the password for group zoomtech

New Password:

Re-enter new password:

**Verification:**

```
[root@localhost ~]# grep zoomtech /etc/gshadow
```

```
zoomtech:$6$KqFT/.FI$TKrAHtcPHa7iEv0c/YG7AvBeELtngSRZWWzxx00Dc/rOK1Nyi5wfekM
```

```
wqd10HNz5.NDCAIty6wghkCC2Id6J70::
```

### 3. Changing the name of an existing group (from zoomtech to zoomgroup)

**Syntax:**

```
[root@localhost ~]# groupmod -n <new_name> <old_name>
```

```
[root@localhost ~]# groupmod -n zoomgroup zoomtech
```

**Verification:**

```
[root@localhost ~]# grep zoomgroup /etc/group
```

```
zoomgroup:x:1000:
```





#### 4. To add single user in a group

**Note:** Before you add user into group create a user

```
[root@localhost ~]# useradd jack
```

**Syntax:**

```
[root@localhost ~]# gpasswd -a <username> <groupname>
```

```
[root@localhost ~]# gpasswd -a jack zoomgroup
```

Adding user **Jack** to group **zoomgroup**

**Verification:**

```
[root@localhost ~]# grep zoomgroup /etc/group
```

```
zoomgroup:x:1000:jack
```

#### 5. To add multiple users in a group

**Note:** Before you add user into group create some users

```
[root@localhost ~]# useradd wiliam
```

```
[root@localhost ~]# useradd sam
```

**Syntax:**

```
[root@localhost ~]# gpasswd -M <user1>,<user2>,<user3> <group_name>
```

```
[root@localhost ~]# gpasswd -M jack,sam,wiliam zoomgroup
```

**Verification:**

```
[root@localhost ~]# grep zoomgroup /etc/group
```

```
zoomgroup:x:1000:jack,sam,wiliam
```

#### 6. To add user in a group as a Secondary member

**Note:** Before you add user into group create a user

```
[root@localhost ~]# useradd ravi
```

**Syntax:**

```
[root@localhost ~]# usermod -G <groupname> <username>
```



```
[root@localhost ~]# usermod -G zoomgroup ravi
```

**Verification:**

```
[root@localhost ~]# grep zoomgroup /etc/group
```

```
zoomgroup:x:1000:jack,sam,wiliam,ravi
```

**7. To add user in a group as a primary member**

**Note:** Before you add user into group create a user

```
[root@localhost ~]# useradd Ali
```

**Syntax:**

```
[root@localhost ~]# usermod -g <groupname> <username>
```

```
[root@localhost ~]# usermod -g zoomgroup Ali
```

**Verification:**

```
[root@localhost ~]# su - Ali
```

```
[Ali@localhost~]$ id
```

```
uid=1004(Ali) gid=1000 (zoomgroup) groups=1000(zoomgroup)
```

```
context=unconfined_u:unconfined_r:unconfined_t:s0-s0:c0.c1023
```

**8. Removing user wiliam from zoomgroup**

**Syntax:**

```
[root@localhost ~]# gpasswd -d <user_name> <group_name>
```

```
[root@localhost ~]# gpasswd -d wiliam zoomgroup
```

**Verification:**

```
[root@localhost ~]# grep zoomgroup /etc/group
```

```
zoomgroup:x:1000:jack,sam,ravi
```



## 9. Deleting a group

### Syntax:

```
[root@localhost ~]# groupdel <group_name>
```

```
[root@localhost ~]# groupdel zoomgroup
```

**Note:** If group contains any primary member, it cannot be deleted unless the gid of that member is changed.

### Verification:

```
[root@localhost ~]# grep zoomgroup /etc/group
```

No group details will be displayed.



## LAB 7: PERMISSIONS

**OBJECTIVE:**

To assign permissions for files and directories

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

1. Adding a new directory(folder)

```
[root@localhost ~]# mkdir /myfolder
```

```
[root@localhost ~]# cd /myfolder/
```

2. Adding new file in directory

```
[root@localhost myfolder]# touch test_file
```

3. To check working username

```
[root@localhost myfolder]# whoami
```

**Result:**

root

4. To check an existing file/dir default permissions

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rw-r--r-- 1 root root 0 sep 1 00:06 test_file
```

5. Set write permissions to the group level only by using Symbolic Mode

**Syntax:**

```
[root@localhost myfolder]# chmod <permission_mode> <file/dir_name>
```

```
[root@localhost myfolder]# chmod g+w test_file
```

**Verification:**

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rw-rw-r-- 1 root root 0 Sep 1 00:06 test_file
```

6. Remove read permissions for others only by using symbolic mode

```
[root@localhost myfolder]# chmod o-r test_file
```

**Verification:**

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rw-rw---- 1 root root 0 Sep 1 00:06 test_file
```



7. Assign read, write and execute permissions to others only by using symbolic mode

```
[root@localhost myfolder]# chmod o=rwx test_file
```

Verification:

```
[root@localhost myfolder]# ls -ld test_file
```

```
.,-rw-rw-rwx 1 root root 0 Sep 1 00:06 test_file
```

8. Assign execute permissions to owner, group and others by using symbolic mode

```
[root@localhost myfolder]# chmod +x test_file
```

Verification:

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rwxrwxrwx 1 root root 0 Jul 13 00:06 test_file
```

9. Remove write and execute permissions from group and others also.

```
[root@localhost myfolder]# chmod g-wx,o-wx test_file
```

Verification:

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rw-r-r- 1 root root 0 Sep 1 00:06 test_file
```

10. Assign write permissions to others by using Absolute Mode(Numeric Mode)

Syntax:

```
[root@localhost myfolder]# chmod <permission_mode><file/dir>
```

```
[root@localhost myfolder]# chmod 646 test_file
```

Verification:

```
[root@localhost myfolder]# ls -ld test_file
```

```
-rw-r--rw- 1 root root 0 sep 1 00:06 test_file
```

11. Assign full permissions to owner, group and others on admin directory using Absolute Mode

```
[root@localhost ~]# chmod 777 /root
```

#### OR #####

12. Assign full permissions to owner, group and others on admin directory using Symbolic Mode





```
[root@localhost ~]# chmod u+rwx,g+rwx,o+rwx /root
```

13. To find result, add a normal user and try to access file as a normal user

```
[root@localhost myfolder]# useradd zoomuser
```

```
[root@localhost myfolder]# su - zoomuser
```

```
[zoomuser@localhost ~]$ cd /root/myfolder
```

**Verification:**

```
[zoomuser@localhost myfolder]$ cat >> test_file
```

This is a zoom user file

**Ctrl+d (to save data)**

```
[zoomuser@localhost myfolder]$ cat test_file
```

This is a zoom user file

**Verification:**

```
[root@localhost ~]# ls -ld /root
```

```
drwxrwxrwx 2 root root 4096 Sep 1 02:22 /root
```

**Note:** user can read and write in file because file is having read and write permissions on other level



## LAB 8: ACCESS CONTROL LIST

**OBJECTIVE:**

To assign permissions for files/folders belonging to different users and groups using Access Control Lists.

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

1. Create some users

```
[root@localhost ~]# useradd tom
```

```
[root@localhost ~]# useradd jack
```

```
[root@localhost ~]# useradd john
```

```
[root@localhost ~]# useradd ali
```

```
[root@localhost ~]# useradd ravi
```

```
[root@localhost ~]# useradd ram
```

2. To find the properties of the newly created users ( 6 users):

```
[root@localhost ~]# tail -6 /etc/passwd
```

```
tom:x:1000:1000::/home/tom:/bin/bash
```

```
jack:x:1001:1001::/home/jack:/bin/bash
```

```
john:x:1002:1002::/home/john:/bin/bash
```

```
ali:x:1003:1003::/home/ali:/bin/bash
```

```
ravi:x:1004:1004::/home/ravi:/bin/bash
```

```
ram:x:1005:1005::/home/ram:/bin/bash
```

3. Create a new group

```
[root@localhost ~]# groupadd salesgrp
```

4. To add users into group

```
[root@localhost ~]# gpasswd -M ali,ravi,ram salesgrp
```

Verification:

```
[root@localhost ~]# grep salesgrp /etc/group
```

```
salesgrp:x:1006:ali,ravi,ram
```



5. Create a file by using 'cat' command

```
[root@localhost ~]# cat > zoom
```

This file is added by root user

**Ctrl+d (to save data)**

6. To apply ACL permissions for file/folder for individual users

**Syntax:**

```
[root@localhost ~]# setfacl -m u:<username>:<permissions> <file/folder>
-m (modify)
```

```
[root@localhost ~]# setfacl -m u:tom:rw zoom
```

```
[root@localhost ~]# setfacl -m u:jack:r zoom
```

```
[root@localhost ~]# setfacl -m u:john:0 zoom
```

7. To apply ACL permissions for file/folder for groups

**Syntax:**

```
[root@localhost ~]# setfacl -m g:<groupname>:<permissions> <file/folder>
```

```
[root@localhost ~]# setfacl -m g:salesgrp:rw zoom
```

8. To check the list of ACL permissions of files/folders

**Syntax:**

```
[root@localhost ~]# getfacl <filename>
```

**Verification:**

```
[root@localhost ~]# getfacl zoom
```

```
# file: zoom
```

```
# owner: root
```

```
# group: root
```

```
user::rw-
```

```
user:tom:rw-
```

```
user:jack:r--
```

```
user:john:---
```

```
group::r--
```

```
group:salesgrp:rw-
```

```
mask::rw-
```

```
other::r--
```



9. To exclude user Tom from ACL list

**Syntax:**

```
[root@localhost ~]# setfacl -x u:<username> <filename>
```

```
[root@localhost ~]# setfacl -x u:tom zoom
```

**Verification**

```
[root@localhost ~]# getfacl zoom
```

```
# file: zoom
# owner: root
# group: root
user::rw-
user:jack:r--
user:john:---
group::r--
group:salesgrp:rw-
mask::rw-
other::r--
```

10. Check the output by logging in as a user jack

```
[root@localhost ~]# su - jack
```

```
[jack@localhost ~]$ cd /root (to enter into root user dir)
```

```
[jack@localhost ~]$ cat zoom
```

**Result:**

This file is added by root user

```
[jack@localhost ~]$ cat >> zoom
```

**Result:**

-bash: zoom: Permission denied

Because jack has only read permissions

**Note:** Similarly login as different users and group members to test the Access List.



## LAB 9: CHANGE OWNERSHIP OF FILES AND DIRECTORIES

**OBJECTIVE:**

To change owners of files/folders .

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**



1. Create a new user

```
[root@localhost ~]# useradd sam
```

2. To give ownership of a file to another user

Syntax:

```
[root@localhost ~]# chown <username> <file/folder>
```

```
[root@localhost ~]# chown sam zoom
```

Verification

```
[root@localhost ~]# ls -ld zoom
```

```
-rw-r--r-- 1 sam root 32 Aug 31 09:46 zoom
```

3. Check the result by logging in as user sam

```
[root@localhost~] su - sam
```

```
[sam@localhost ~]$ cd /root (to enter into root user dir)
```

```
[sam@localhost~]$ cat zoom
```

Result:

This file is added by root user

```
[sam@localhost ~]$ cat >> zoom (try to read)
```

Sam is a good boy

ctrl+d (to save)

```
[sam@localhost~]$ cat zoom (try to read)
```

Result:

This file is added by root user

Sam is a good boy



## LAB 10 : CHANGE GROUP OWNER OF FILES AND DIRECTORIES

**OBJECTIVE:**

To change the group owner of a file/folder.

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

1. Create a group

```
[root@localhost ~]# groupadd techgrp
```

2. Create some users

```
[root@localhost ~]# useradd kumar
```

```
[root@localhost ~]# useradd vali
```

3. Add users in a group

```
[root@localhost ~]# gpasswd -M kumar,vali techgroup
```

Verification

```
[root@localhost ~]# grep techgroup /etc/group
```

```
Techgrp:x:1000:kumar,vali
```

4. To change group owner of a file

Syntax:

```
[root@localhost ~]# chgrp <group_name> <file/folder>
```

```
[root@localhost ~]# chgrp techgrp zoom
```

5. To give write permissions to group owner on file

```
[root@localhost ~]# chmod g+w zoom
```

Verification:

```
[root@localhost ~]# ls -ld zoom
```

```
-rw-rw-r-- 1 sam techgrp 32 Aug 31 09:46 zoom
```

6. Check the result by logging in as a techgrp user

```
[root@localhost ~]# su - vali
```

```
[vali@localhost ~]$ cd /root (to enter into root user dir)
```

```
[vali@localhost ~]$ cat zoom
```



**Result:**

This file is added by root user

Sam is a good boy

**[vali@localhost~]\$ cat >> zoom**

Vali is a good boy

**Ctrl+d (to save)**

**[vali@localhost~]\$ cat zoom**

This file is added by root user

Sam is a good boy

Vali is a good boy

Zoom Technologies



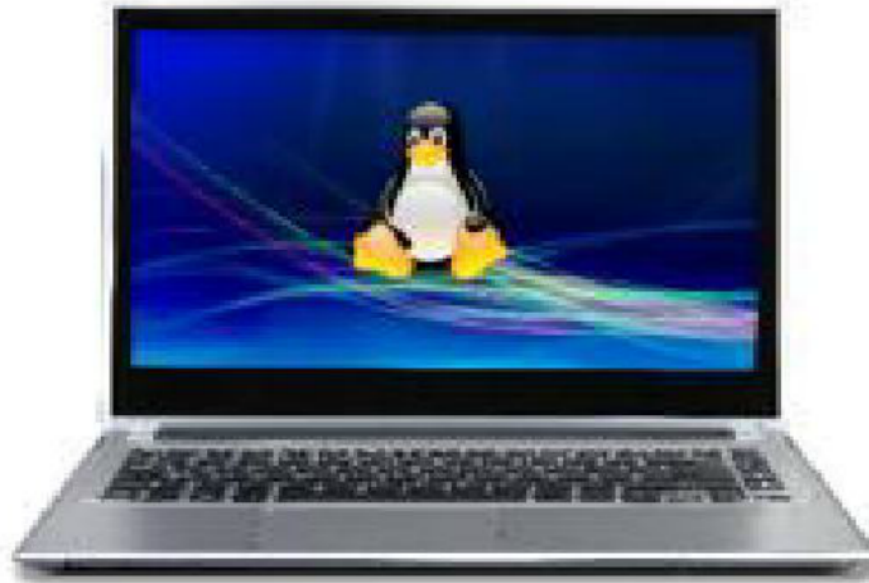
## LAB 11: PARTITIONS

**OBJECTIVE:**

To create a new partition on the hard disk

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

## 1. Check the existing partitions on the hard disk

### Syntax:

```
[root@client1 ~]# fdisk <option>
```

```
[root@client1 ~]# fdisk -l
```

### Result:

Disk /dev/sda: 41.9 GB, 41875931136 bytes, 81788928 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris

## 2. Enter the hard disk by using fdisk command

```
[root@client1 ~]# fdisk /dev/sda
```

### Command (m for help): m

```
d  delete a partition
m  print this menu
n  add a new partition
p  print the partition table
q  quit without saving changes
w  write table to disk and exit
```

Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

### Command (m for help): n

First cylinder (1098-2434, default 1098): **Press enter (key to skip cylinders option)**

Using default value 1098

Last cylinder or +size or +sizeM or +sizeK (1098-2434, default 2434): **+100M (partition size)**





Command (m for help): **p (to print new changes)**

Disk /dev/sda: 41.9 GB, 41875931136 bytes, 81788928 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	1024	83	Linux

Partition table entries are not in disk order

Command (m for help): **w (to save and quit)**

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

### 3. Update new partition changes to kernel

#### Syntax:

[root@client1 ~]# partprobe <disk\_name>

[root@client1 ~]# partprobe /dev/sda

#### Verification:

No error message means updated successfully



```
[root@client1 ~]# fdisk -l
```

Disk /dev/sda: 41.9 GB, 41875931136 bytes, 81788928 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	102400	83	Linux

#### 4. Make file system i.e... (format the partition)

##### Syntax:

```
[root@client1 ~]# mkfs.ext4 <partition no>
```

```
[root@client1 ~]# mkfs.ext4 /dev/sda8
```

##### Result:

mke2fs 1.42.9 (28-Dec-2013)

Filesystem too small for a journal

Filesystem label=

OS type: Linux

Block size=1024 (log=0)

Fragment size=1024 (log=0)

Stride=0 blocks, Stripe width=0 blocks

128 inodes, 1024 blocks

51 blocks (4.98%) reserved for the super user

First data block=1

Maximum filesystem blocks=1048576

1 block group

8192 blocks per group, 8192 fragments per group

128 inodes per group

Allocating group tables: done



Writing inode tables: done

Writing superblocks and filesystem accounting information: done

##### OR #####

```
[root@client1 ~]# mkfs.vfat /dev/sda8
```

**Result:**

mkfs.fat 3.0.20 (12 Jun 2013)

**5. To check file system type of partition**

```
[root@client1 ~]# blkid /dev/sda8
```

**Result:**

/dev/sda8: UUID="08b85639-6ce3-4d4c-8d55-19c24ab0756a" TYPE="ext4"

**6. Create a folder and mount the partition to use**

```
[root@client1 ~]# mkdir /mnt/linux
```

**Syntax:**

```
[root@client1 ~]# mount <partition_no.> <directory>
```

```
[root@client1 ~]# mount /dev/sda8 /mnt/linux
```

**7. Check the mounted partition**

```
[root@client1 ~]# mount | grep /mnt/linux
```

/dev/sda8 on /mnt/linux type ext4 (rw,relatime,seclabel)



8 . Write the data on the partition

```
[root@client1 ~]# cd /mnt/linux
```

```
[root@client1 linux]#
```

```
[root@client1 linux]# touch myfile myfile1 myfile2
```

```
[root@client1 linux]# mkdir dsnr secbad bhills ameerpet
```

```
[root@client1 linux]# ls
```

```
ameerpet bhills dsnr lost+found myfile myfile1 myfile2 secbad
```



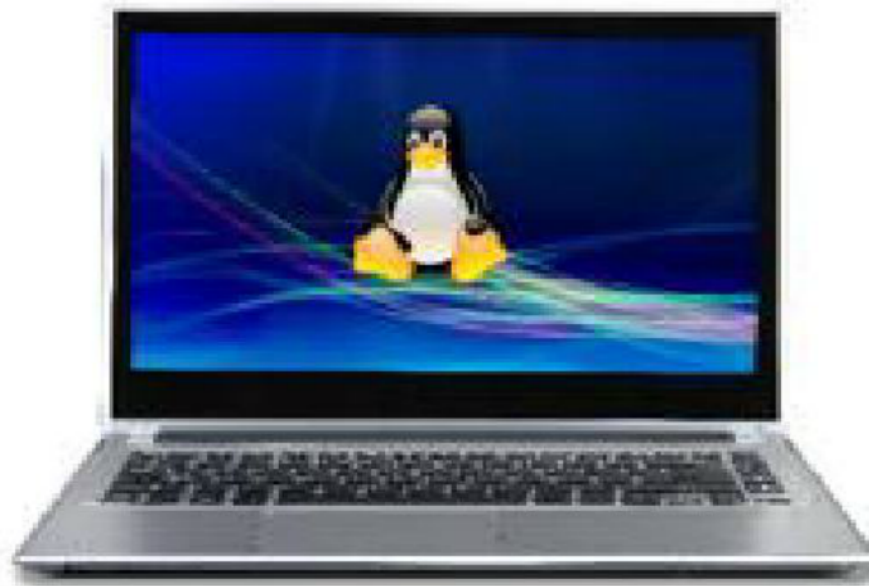
## LAB 12: SWAP PARTITION (VIRTUAL MEMORY)

**OBJECTIVE:**

To create a swap partition for faster performance .

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**



## 1. Check the RAM size

```
[root@client1 ~]# free -m
```

### Result:

	total	used	free	shared	buffers	cached
Mem:		979	918	61	1	0
-/+ buffers/cache:			862	117		
Swap:	1999	1173	826			

## 2. Create a new partition twice the size of RAM

```
[root@client1 ~]# fdisk /dev/sda
```

Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

**Command (m for help): n (to add new partition>**

First cylinder (1098-2434, default 1098): **Press enter key to skip cylinders size**

Using default value 1098

Last cylinder or +size or +sizeM or +sizeK (1098-2434, default 2434): **+2GB (partition size)**

**Command (m for help): t (to change the partition ID)**

Partition number (1-9, default 9): **9**

Hex code (type L to list all codes): **82 (assigning swap code value)**

Changed type of partition 'Linux' to 'Linux swap / Solaris'

**Command (m for help): w (to save new changes)**

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.





### 3. Update new partition changes to kernel

#### Syntax:

```
[root@client1 ~]# partprobe <device_name>
```

```
[root@client1 ~]# partprobe /dev/sda
```

#### Verification:

No error message means updated successfully

```
[root@client1 ~]# fdisk -l
```

Disk /dev/sda: 41.9 GB, 41875931136 bytes, 81788928 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	102400	83	Linux
/dev/sda9		62683136	66588671	1952768	82	Linux swap / Solaris

### 4 . Format the partition by using swap filesystem

#### Syntax:

```
[root@client1 ~]# mkswap <partition_no.>
```

```
[root@client1 ~]# mkswap /dev/sda9
```

#### Result:

Setting up swapspace version 1, size = 1952764 KiB

no label, UUID=0b6c9b8f-b4a9-45bf-bf90-14a076cd334e



## 5. Turn on the swap partition

### Syntax:

```
[root@client1 ~]# swapon <partition_no.>
```

```
[root@client1 ~]# swapon /dev/sda9
```

## 6. To see the swap partition status

```
[root@client1 ~]# swapon -s
```

### Result:

Filename	Type	Size	Used	Priority
/dev/sda7	partition	2047996	1225984	-1
/dev/sda9	partition	1952764	0	-2

## 7. Check the newly added swap partition size

### Verification

```
[root@client1 ~]# free -m
```

```
total      used    free   shared  buffers   cached
Mem:      979     909      70       1        0       40
-/+ buffers/cache: 868    111
Swap:3906    1197    2709
```

## 8. To Turn Off the swap partition

```
[root@client1 ~]# swapoff /dev/sda9
```

### Result:

```
[root@client1 ~]# swapon -s
```

Filename	Type	Size	Used	Priority
/dev/sda7	partition	2047996	1225984	-1

**Note:** /dev/sda9 swap partition is not displayed



## LAB 13: DISK LABEL

**OBJECTIVE:**

To Label a Disk

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

### 1. To Assign label name on partition

**Syntax:**

```
[root@client1 ~]# e2label <partition_no.> <label_name>
```

```
[root@client1 ~]# e2label /dev/sda8 /songs
```

### 2. To check label name of partition

**Syntax:**

```
[root@client1 ~]# e2label <partition_no.>
```

```
[root@client1 ~]# e2label /dev/sda8
```

**Result:**

```
/songs
```

### 3. Mounting the partition with label name

**Syntax**

```
[root@client1 ~]# mount LABEL=<label_name> <directory_name>
```

```
[root@client1 ~]# mount LABEL=/songs /myfolder
```

### 4. Check mount point with label

```
[root@client1 ~]# mount -l | grep /songs
```

**Result:**

```
/dev/sda8 on /myfolder type ext4 (rw,relatime,data=ordered)[/songs]
```

### 5. Permanently mounting the partition with label name

```
[root@client1 ~]# vi /etc/fstab
```

```
LABEL=/songs /myfolder ext4 defaults 0 0
```

```
wq:
```



**6. To see the utilization of disk space**

```
[root@client1 ~]# df -hT
```

**Result:**

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda3	ext4	7.6G	111M	7.1G	2%	/
devtmpfs	devtmpfs	482M	0	482M	0%	/dev
tmpfs	tmpfs	490M	14M	477M	3%	/run
/dev/sda5	ext4	7.6G	3.7G	3.6G	52%	/usr
/dev/sda1	ext4	477M	77M	371M	18%	/boot
/dev/sda2	ext4	9.5G	130M	8.9G	2%	/var
/dev/sda6	ext4	1.9G	6.1M	1.8G	1%	/home
/dev/sr0	iso9660	6.6G	6.6G	0	100%	/run/media/root/CentOS 7 x86_64
/dev/sda8	ext4	93M	1.6M	85M	2%	/mnt/linux

**7. To see the block size.****Syntax:**

```
[root@client1 ~]# blockdev --getbsz <partition_no.>
```

```
[root@client1 ~]# blockdev --getbsz /dev/sda9
```

**Result:**

```
4096
```



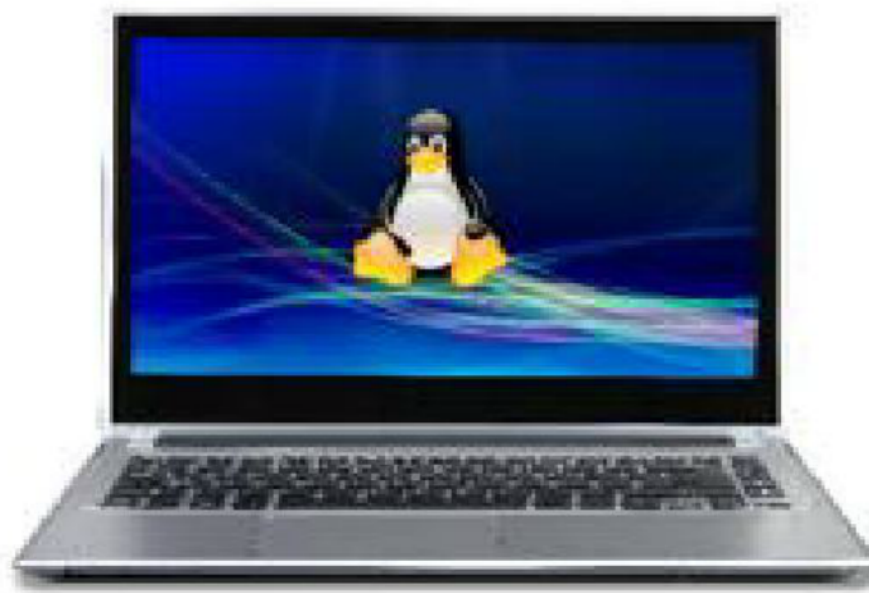
## LAB 14 : DISK QUOTAS

**OBJECTIVE:**

To allocate disk space to users and groups

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**



## 1. Create the required partition for disk quotas

```
[root@localhost ~]# fdisk -l
```

### Result:

Disk /dev/sda: 41.9 GB, 41875931136 bytes, 81788928 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	102400	83	Linux
/dev/sda9		62683136	66588671	1952768	82	Linux swap / Solaris

## 2. Add the new partition

```
[root@localhost ~]# fdisk /dev/sda
```

Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

**Command (m for help): n**

First cylinder (2315-4865, default 2315):

Using default value 2315

Last cylinder or +size or +sizeM or +sizeK (2315-4865, default 4865): +100M

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)



Command (m for help): **w (to save and quit)**

The partition table has been altered!

Syncing disks.

### 3. Update the new changes to kernel

```
[root@localhost ~]# partprobe /dev/sda
```

#### Verification:

No error message means updated successfully

### 4. View the newly added partition

```
[root@localhost ~]# partprobe /dev/sda
```

#### Verification:

```
/dev/sda1 *    2048  1026047  512000  83 Linux
/dev/sda2      1026048  21506047  10240000  83 Linux
/dev/sda3      21506048  37890047  8192000  83 Linux
/dev/sda4      37890048  81788927  21949440  5 Extended
/dev/sda5      37894144  54278143  8192000  83 Linux
/dev/sda6      54280192  58376191  2048000  83 Linux
/dev/sda7      58378240  62474239  2048000  82 Linux swap / Solaris
/dev/sda8      37892096  37894143  102400  83 Linux
/dev/sda9      62476288  66381823  1952768  82 Linux swap / Solaris
/dev/sda10     66383872  66588671  102400  83 Linux
```

### 5. Format the partition by using filesystem

```
[root@localhost ~]# mkfs.ext4 /dev/sda10
```

### 6. Create a new directory to mount the quota partition

```
[root@localhost ~]# mkdir /salesdept
```

### 7. Mount the partition with user and group quota parameters.

#### Syntax:

```
[root@localhost ~]# mount -o <usrquota,grpquota> <partition_no> <directory_name>
```



```
[root@localhost ~]# mount -o usrquota,grpquota /dev/sda10 /salesdept
```

8. Check only the mount point of quota partition

```
[root@localhost ~]# mount | grep /salesdept
```

Result:

```
/dev/sda10 on /salesdept type ext4  
(rw,relatime,seclabel,quota,usrquota,grpquota,data=ordered)
```

9. Give full permissions on quota partition

```
[root@localhost ~]# chmod 777 /salesdept/
```

```
[root@localhost ~]# ls -ld /salesdept
```

Result:

```
drwxrwxrwx. 3 root root 1024 Sep  1 11:54 /salesdept
```

10. Create the Quota Database on partition

Syntax:

```
[root@localhost ~]# quotacheck <options> <mount_point>
```

-c (create)

-u (user level)

-g (group level)

-v (verbose)

```
[root@localhost ~]# quotacheck -cugv /salesdept
```

subtracted.

quotacheck: Checked 2 directories and 0 files

quotacheck: Old file not found.

quotacheck: Old file not found.

Verification:

```
[root@localhost ~]# ls /salesdept
```

```
aquota.group aquota.user lost+found
```



## 11. Check the quota Status

### Syntax:

```
[root@localhost~]# quotaon -p <mount_point>
```

### Verification:

```
[root@localhost ~]# quotaon -p /salesdept  
group quota on /salesdept (/dev/sda10) is off  
user quota on /salesdept (/dev/sda10) is off
```

## 12. Enable the quota on partition

### Syntax:

```
[root@localhost ~]# quotaon <mount_point>
```

```
[root@localhost ~]# quotaon /salesdept
```

### Verification:

```
[root@localhost ~]# quotaon -p /salesdept  
group quota on /salesdept (/dev/sda10) is on  
user quota on /salesdept (/dev/sda10) is on
```

## 13. Create users and groups

```
[root@localhost ~]# useradd tom
```

```
[root@localhost ~]# groupadd salesgrp
```

```
[root@localhost ~]# groupadd fingrp
```

## 14. Add users as a primary member in groups

```
[root@localhost ~]# useradd -g salesgrp sai
```

```
[root@localhost ~]# useradd -g salesgrp ram
```

## 15. Apply quota on a user tom

### Syntax:

```
[root@localhost ~]# edquota -u <username>
```



```
[root@localhost ~]# edquota -u tom
```

**Result:**

Disk quotas for user tom (uid 1000):

Filesystem	blocks	soft	hard	inodes	soft	hard
/dev/sda10	0	0	0	0	3	5

```
:wq(save and quit)
```

16. To check result ,login as user tom

```
[root@localhost ~]# su - tom
```

```
[tom@localhost ~]$ cd /salesdept/
```

```
[tom@localhost salesdept]$ ll
```

**Result of quota files:**

```
-rw-----. 1 root root 6144 Sep  1 12:05 aquota.group
```

```
-rw-----. 1 root root 6144 Sep  1 12:05 aquota.user
```

```
drwx-----. 2 root root 12288 Sep  1 11:54 lost+found
```

```
[tom@localhost salesdept]$ touch file1
```

```
[tom@localhost salesdept]$ touch file2
```

```
[tom@localhost salesdept]$ touch file3
```

```
[tom@localhost salesdept]$ touch file4
```

**Result:**

```
sda10: warning, user file quota exceeded.
```

```
[tom@localhost salesdept]$ touch file5
```

```
[tom@localhost salesdept]$ touch file6
```

**Result:**

```
sda10: write failed, user file limit reached.
```

```
mkdir: cannot create directory `file6': Disk quota exceeded
```





17. Apply quota on a group salesgrp which has sai and ram as primary members

**Syntax:**

```
[root@localhost ~]# edquota -g <group_name>
```

```
[root@localhost ~]# edquota -g salesgrp
```

**Result:**

Disk quotas for group salesgrp (gid 1002):

Filesystem	blocks	soft	hard	inodes	soft	hard
/dev/sda10	0	0	0	5	3	5

:wq!(save and quit)

18. To check result, try to add data as the group member sai

```
[root@localhost salesdept]# su - sai
```

```
[sai@localhost salesdept]$ cd /salesdept (enter into disk quota dir)
```

```
[sai@localhost salesdept]$ touch file1 file2 file3
```

```
[sai@localhost salesdept]$ exit (to logout user)
```

```
exit
```

```
[root@localhost salesdept]# su - ram
```

```
[ram@localhost salesdept]$ cd /salesdept
```

```
[ram@localhost salesdept]$ touch file4
```

```
sda10: warning, group file quota exceeded.
```

```
[ram@localhost salesdept]$ touch file5
```

```
[ram@localhost salesdept]$ touch file6
```

**Result:**

```
sda10: write failed, group file limit reached.
```

```
touch: cannot touch `file6': Disk quota exceeded
```





[ram@localhost salesdept]\$ ll

total 36

-rw----- 1 root root 7168 Sep 1 01:52 aquota.group

-rw----- 1 root root 7168 Sep 1 01:53 aquota.user

drwx----- 2 root root 16384 Sep 1 01:38 lost+found

-rw-r--r-- 1 ram salesgrp 0 Sep 1 01:53 file5

-rw-r--r-- 1 ram salesgrp 0 Sep 1 01:53 file4

-rw-r--r-- 1 sai salesgrp 0 Sep 1 01:53 file1

-rw-r--r-- 1 sai salesgrp 0 Sep 1 01:53 file2

-rw-r--r-- 1 sai salesgrp 0 Sep 1 01:53 file3

[ram@localhost salesdept]\$

**Note: Quotas are not applicable on secondary group members**



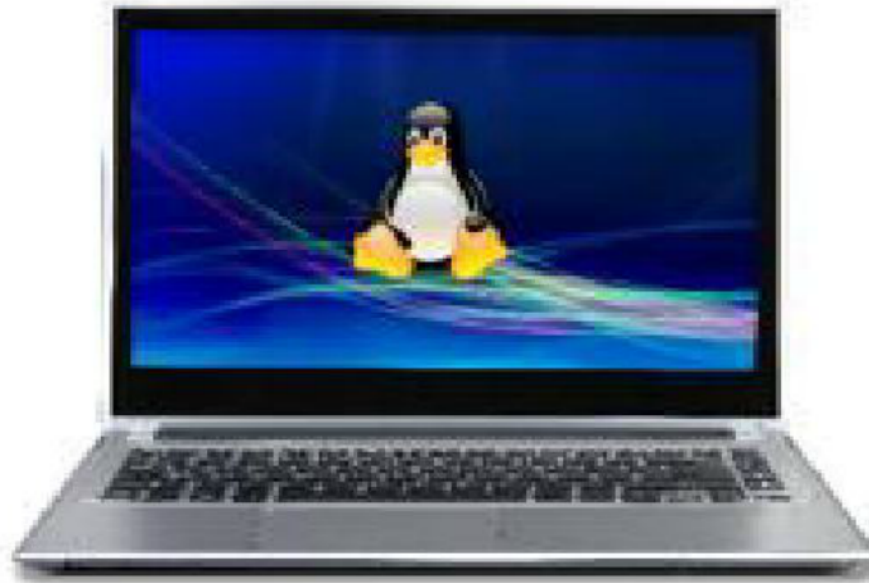
## LAB 15: LOGICAL VOLUME MANAGER (LVM)

**OBJECTIVE:**

To resize block storage i.e logical volumes on harddisk, partitions, or SAN storage.

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

## 1. View hard disk details and list of partitions

### Syntax:

```
[root@localhost ~]# <fdisk -l>
```

```
[root@localhost ~]# fdisk -l
```

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x000b85b7

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	616447	307200	83	Linux
/dev/sda2		616448	14952447	7168000	83	Linux
/dev/sda3		14952448	27240447	6144000	83	Linux
/dev/sda4		27240448	62914559	17837056	5	Extended
/dev/sda5		27244544	39532543	6144000	83	Linux
/dev/sda6		39534592	41582591	1024000	83	Linux
/dev/sda7		41584640	43632639	1024000	82	Linux swap / Solaris
/dev/sda8		27242496	27244543	102400	83	Linux
/dev/sda9		43634688	44249087	307200	83	Linux

## 2. Create partition of required size ,for eg : Two partitions of 300 MB each

### Syntax:

```
[root@localhost ~]# <fdisk <device_name>
```

```
[root@localhost ~]# fdisk /dev/sda
```

Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

Command (m for help): **n**

All primary partitions are in use

Adding logical partition 10



First sector (44251136-62914559, default 44251136):

Using default value 44251136

Last sector, +sectors or +size{K,M,G} (44251136-62914559, default 62914559): **+300M**

Partition 10 of type Linux and of size 300 MiB is set

Command (m for help): **n**

All primary partitions are in use

Adding logical partition 11

First sector (44867584-62914559, default 44867584):

Using default value 44867584

Last sector, +sectors or +size{K,M,G} (44867584-62914559, default 62914559): **+300M**

Partition 11 of type Linux and of size 300 MiB is set

Command (m for help): **w**

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

### 3. Update newly created partitions to kernel without restarting.

#### Syntax:

```
[root@localhost~]# partprobe <disk_name>
```

```
[root@localhost~]# partprobe /dev/sda
```

#### Verification:

No error message means updated successfully

### 4. Now confirm the list of newly created partitions

```
[root@localhost ~]# fdisk -l
```



### **Verification:**

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x000b85b7

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	616447	307200	83	Linux
/dev/sda2		616448	14952447	7168000	83	Linux
/dev/sda3		14952448	27240447	6144000	83	Linux
/dev/sda4		27240448	62914559	17837056	5	Extended
/dev/sda5		27244544	39532543	6144000	83	Linux
/dev/sda6		39534592	41582591	1024000	83	Linux
/dev/sda7		41584640	43632639	1024000	82	Linux swap / Solaris
/dev/sda8		27242496	27244543	1024	83	Linux
/dev/sda9		43634688	44249087	307200	83	Linux
/dev/sda10		44251136	44865535	307200	83	Linux
/dev/sda11		44867584	45481983	307200	83	Linux

## **5. Create Physical Volumes**

### **Syntax:**

```
[root@localhost ~]# pvcreate <partition_number>
```

```
[root@localhost ~]# pvcreate /dev/sda10 /dev/sda11
```

### **Result:**

Physical volume "/dev/sda10" successfully created

Physical volume "/dev/sda11" successfully created

## **6. View the list of Physical Volumes**

### **Syntax:**

```
[root@localhost ~]# pvdisplay <pv_name>
```





```
[root@localhost ~]# pvdisplay
```

**Result:**

"/dev/sda10" is a new physical volume of "300.00 MiB"

--- NEW Physical volume ---

PV Name	/dev/sda10
VG Name	
PV Size	300.00 MiB
Allocatable	NO
PE Size	0
Total PE	0
Free PE	0
Allocated PE	0
PV UUID	5UVcYc-D2OD-3YyC-5KRm-zfNX-cOAY-SCcyeK

"/dev/sda11" is a new physical volume of "300.00 MiB"

--- NEW Physical volume ---

PV Name	/dev/sda11
VG Name	
PV Size	300.00 MiB
Allocatable	NO
PE Size	0
Total PE	0
Free PE	0
Allocated PE	0
PV UUID	jVx5Gd-MA9a-Opwv-DeDO-LYHD-sLet-aeAMke

**7. Create Volume Group****Syntax:**

```
[root@localhost ~]# vgcreate <volume_group_name><physical_volume_name>
```

```
[root@localhost ~]# vgcreate zoomgroup /dev/sda10 /dev/sda11
```

**Result:**

Volume group "zoomgroup" successfully created

**8. Display Volume Group Information.****Syntax:**

```
[root@localhost ~]# vgdisplay
```





```
[root@localhost ~]#vgdisplay
```

**Verification**

```
--- Volume group ---
```

```
VG Name          zoomgroup
System ID
Format           lvm2
Metadata Areas    2
Metadata Sequence No 1
VG Access         read/write
VG Status         resizable
MAX LV           0
Cur LV          0
Open LV          0
Max PV           0
Cur PV          2
Act PV           2
VG Size          592.00 MiB
PE Size          4.00 MiB
Total PE         148
Alloc PE / Size   0 / 0
Free PE / Size    148 / 592.00 MiB
VG UUID          UjE4o2-pTnn-27cA-Mo8n-017W-zvQg-zLm2xA
```

To create logical Volume

**9. Create logical Volumes in Volume Group****Syntax:**

```
[root@localhost ~]# lvcreate <volume_group_name> -L <+size_of_logical_volume> -n
<logical_volume_name>
```

-L logical volume

-n name of logical volume

```
[root@localhost ~]# lvcreate zoomgroup -L +300M -n lv1
```

**Result:**

Logical volume "lv1" created



**10. View Logical Volume details.****Syntax:**

```
[root@localhost ~]# lvdisplay
```

```
[root@localhost ~]# lvdisplay
```

**Verification:**

```
--- Logical volume ---
```

```
LV Path          /dev/zoomgroup/lv1
LV Name          lv1
VG Name          zoomgroup
LV UUID          dPTAZW-BWck-Ysb0-feSU-XUYF-EYn7-PA9GQf
LV Write Access   read/write
LV Creation host, time localhost.localdomain, 2015-08-31 13:36:39 +0530
LV Status        available
# open           0
LV Size          300.00 MiB
Current LE       75
Segments         2
Allocation       inherit
Read ahead sectors auto
- currently set to 8192
Block device     253:0
```

**11. Make filesystem ( i.e format ) for the Logical Volume**

```
[root@localhost ~]# mkfs.ext4 /dev/zoomgroup/lv1
```

```
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
Stride=0 blocks, Stripe width=0 blocks
76912 inodes, 307200 blocks
15360 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=33947648
38 block groups
8192 blocks per group, 8192 fragments per group
2024 inodes per group
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729, 204801, 221185
```



Allocating group tables: done  
Writing inode tables: done  
Creating journal (8192 blocks): done  
Writing superblocks and filesystem accounting information: done

**12. Create a folder and mount the Logical Volume**

```
[root@localhost ~]# mkdir /mylvm  
[root@localhost ~]# mount /dev/zoomgroup/lv1 /mylvm
```

**13. To check LVM mounted partition**

```
[root@localhost ~]# mount | grep /mylvm
```

**Verification:**

```
/dev/mapper/zoomgroup-lv1 on /mylvm type ext4 (rw,relatime,data=ordered)
```

**14. To resize the Logical Volume**

**Syntax :**

```
[root@localhost ~]# lvresize -L <+size_of_logical_volume> -n <logical_volume_name>
```

```
[root@localhost ~]# lvresize -L +100M -n /dev/zoomgroup/lv1
```

**Result:**

```
Extending logical volume lv1 to 400.00 MB  
Logical volume lv1 successfully resized
```

**15. To check newly created logical volume size had increased.**

```
[root@localhost ~]# lvsdisplay
```

**Verification:**

```
--- Logical volume ---  
LV Path          /dev/zoomgroup/lv1  
LV Name          lv1  
VG Name          zoomgroup  
LV UUID          dPTAZW-BWck-Ysb0-feSU-XUYF-EYn7-PA9GQf  
LV Write Access   read/write  
LV Creation host, time localhost.localdomain, 2015-08-31 13:36:39 +0530  
LV Status         available  
# open           1
```



```
LV Size      400.00 MiB
Current LE   100
Segments    2
Allocation   inherit
Read ahead sectors  auto
- currently set to 8192
Block device 253:0 [root@localhost ~]# cd /mylvm
```

```
[root@localhost mylvm]# ls
lost+found
```

#### 16. Now check partition size

```
[root@localhost ~]# df -h
```

##### Result:

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/sda3	5.7G	68M	5.3G	2%	/
devtmpfs	1.5G	0	1.5G	0%	/dev
tmpfs	1.5G	80K	1.5G	1%	/dev/shm
tmpfs	1.5G	9.0M	1.5G	1%	/run
tmpfs	1.5G	0	1.5G	0%	/sys/fs/cgroup
/dev/sda5	5.7G	3.6G	1.9G	66%	/usr
/dev/sda6	969M	8.5M	894M	1%	/home
/dev/sda1	283M	77M	188M	29%	/boot
/dev/sda2	6.7G	4.1G	2.2G	65%	/var
/dev/mapper/zoomgroup-lv1	283M	2.1M	262M	1%	/mylvm

#### 17. We still find the same partition size, so update the kernel. Resize the logical volume at OS level to update kernel.

##### Syntax:

```
[root@localhost ~]# resize2fs <logical_volume_name>
```

```
[root@localhost ~]# resize2fs /dev/zoomgroup/lv1
```

##### Result:

```
resize2fs 1.42.9 (28-Dec-2013)
```

```
Filesystem at /dev/zoomgroup/lv1 is mounted on /mylvm; on-line resizing required
```

```
old_desc_blocks = 3, new_desc_blocks = 4
```

```
The filesystem on /dev/zoomgroup/lv1 is now 409600 blocks long.
```

```
[root@localhost ~]# df -h
```

**Result:**

Filesystem	Size	Used	Avail	Use%	Mounted on
/dev/sda3	5.7G	68M	5.3G	2%	/
devtmpfs	1.5G	0	1.5G	0%	/dev
tmpfs	1.5G	80K	1.5G	1%	/dev/shm
tmpfs	1.5G	9.0M	1.5G	1%	/run
tmpfs	1.5G	0	1.5G	0%	/sys/fs/cgroup
/dev/sda5	5.7G	3.6G	1.9G	66%	/usr
/dev/sda6	969M	8.5M	894M	1%	/home
/dev/sda1	283M	77M	188M	29%	/boot
/dev/sda2	6.7G	4.1G	2.2G	65%	/var
/dev/mapper/zoomgroup-lv1	380M	2.3M	355M	1%	/mylvm

**Note:** Mounted partition size had increase and updated.

**18. Now create some files and folders on logical volume**

```
[root@localhost mylvm]# touch file1 file2 file3
```

```
[root@localhost mylvm]# mkdir hyd sec
```

**Verification:**

```
[root@localhost mylvm]# ls
```

```
file1 file2 file3 hyd lost+found sec
```

**19. To extend the volume group, create a new partition and add to volume group.**

```
[root@localhost ~]# fdisk /dev/sda
```

```
Command (m for help): n
```

```
All primary partitions are in use
```

```
Adding logical partition 12
```

```
First sector (45484032-62914559, default 45484032):
```

```
Using default value 45484032
```

```
Last sector, +sectors or +size{K,M,G} (45484032-62914559, default 62914559): +300M
```

```
Partition 12 of type Linux and of size 300 MiB is set
```

```
Command (m for help): w
```

```
The partition table has been altered!
```

```
Calling ioctl() to re-read partition table.
```



WARNING: Re-reading the partition table failed with error 16: Device or resource busy.  
The kernel still uses the old table. The new table will be used at  
the next reboot or after you run partprobe(8) or kpartx(8)  
Syncing disks.

## 20. Now update kernel

```
[root@localhost ~]# partprobe /dev/sda
```

## 21. To view the list of partitions

```
[root@localhost ~]# fdisk -l
```

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors  
Units = sectors of 1 \* 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disk label type: dos  
Disk identifier: 0x000b85b7

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	616447	307200	83	Linux
/dev/sda2		616448	14952447	7168000	83	Linux
/dev/sda3		14952448	27240447	6144000	83	Linux
/dev/sda4		27240448	62914559	17837056	5	Extended
/dev/sda5		27244544	39532543	6144000	83	Linux
/dev/sda6		39534592	41582591	1024000	83	Linux
/dev/sda7		41584640	43632639	1024000	82	Linux swap / Solaris
/dev/sda8		27242496	27244543	1024	83	Linux
/dev/sda9		43634688	44249087	307200	83	Linux
/dev/sda10		44251136	44865535	307200	83	Linux
/dev/sda11		44867584	45481983	307200	83	Linux
/dev/sda12		45484032	46098431	307200	83	Linux

Partition table entries are :not in disk order

Disk /dev/mapper/zoomgroup-lv1: 419 MB, 419430400 bytes, 819200 sectors  
Units = sectors of 1 \* 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes





```
[root@localhost ~]# pvcreate /dev/sda12
```

**Result:**

Physical volume "/dev/sda12" successfully created

**22. To extend the volume group.****Syntax :**

```
[root@localhost ~]# vgextend <volume_group_name> <physical_volume_name>
```

```
[root@localhost ~]# vgextend zoomgroup /dev/sda12
```

**Result:**

Volume group "zoomgroup" successfully extended

**Verification:**

```
[root@localhost ~]# vgdisplay
```

```
--- Volume group ---
VG Name          zoomgroup
System ID
Format           lvm2
Metadata Areas    3
Metadata Sequence No 4
VG Access         read/write
VG Status         resizable
MAX LV           0
Cur LV           1
Open LV           1
Max PV            0
Cur PV           3
Act PV            3
VG Size          888.00 MiB
PE Size           4.00 MiB
Total PE          222
Alloc PE / Size   100 / 400.00 MiB
Free PE / Size    122 / 488.00 MiB
VG UUID           UjE4o2-pTnn-27cA-Mo8n-017W-zvQg-zLm2xA
```

Note: Volume group size had increased.

### 23. To remove logical Volume

**Note:** First unmount the logical volume then remove it. While unmounting you should not be in mounted folder.

```
root@localhost ~]# cd
```

```
[root@localhost ~]# umount /mylvm
```

#### Verification of removing logical volumes, volume group and physical volumes

```
[root@localhost ~]# lvremove /dev/zoomgroup/lv1
```

Do you really want to remove active logical volume "lv1"? [y/n]: y

Logical volume "lv1" successfully removed

```
[root@localhost ~]# vgremove /dev/zoomgroup
```

#### Result:

Volume group "zoomgroup" successfully removed

```
[root@localhost ~]# pvremove /dev/sda{10..12}
```

#### Result:

Labels on physical volume "/dev/sda10" successfully wiped

Labels on physical volume "/dev/sda11" successfully wiped

Labels on physical volume "/dev/sda12" successfully wiped



## LAB 16 : REDUNDANT ARRAY OF INDEPENDENT DISKS (RAID)

**OBJECTIVE:**

To backup data with RAID 5 Technology

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

## 1. To view list of all created partitions

### Syntax:

```
[root@localhost~]# fdisk <option>
```

```
[root@localhost ~]# fdisk -l
```

### Verification:

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	1024	83	Linux
/dev/sda9		62476288	66381823	1952768	83	Linux
/dev/sda10		66383872	66588671	102400	83	Linux

Partition table entries are not in disk order

## 2. Add some partitions

```
[root@localhost~]# fdisk /dev/sda
```

Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

Command (m for help): **n**

All primary partitions are in use

Adding logical partition **11**

First sector (66590720-81788927, default 66590720):



Using default value 66590720

Last sector, +sectors or +size{K,M,G} (66590720-81788927, default 81788927): **+100M**

Partition 11 of type Linux and of size 100 MiB is set

Command (m for help): **n**

All primary partitions are in use

Adding logical partition **12**

First sector (66797568-81788927, default 66797568):

Using default value 66797568

Last sector, +sectors or +size{K,M,G} (66797568-81788927, default 81788927): **+100M**

Partition 12 of type Linux and of size 100 MiB is set

Command (m for help): **n**

All primary partitions are in use

Adding logical partition **13**

First sector (67004416-81788927, default 67004416):

Command (m for help): **n**

All primary partitions are in use

Adding logical partition **14**

Using default value 67004416

Last sector, +sectors or +size{K,M,G} (67004416-81788927, default 81788927): **+100M**

Partition 13 of type Linux and of size 100 MiB is set

First sector (67004416-81788927, default 67004416):

Using default value 67004416

Last sector, +sectors or +size{K,M,G} (67004416-81788927, default 81788927): **+100M**

Partition 13 of type Linux and of size 100 MiB is set

Command (m for help): **w**

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

### 3. Update the newly added partitions to kernel

```
[root@localhost ~]# partprobe /dev/sda
```





#### 4. check new added partitions

```
[root@localhost~]# fdisk -l
```

Disk /dev/sda: 32.2 GB, 32212254720 bytes, 62914560 sectors

Units = sectors of 1 \* 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk label type: dos

Disk identifier: 0x00040059

Device	Boot	Start	End	Blocks	Id	System
/dev/sda1	*	2048	1026047	512000	83	Linux
/dev/sda2		1026048	21506047	10240000	83	Linux
/dev/sda3		21506048	37890047	8192000	83	Linux
/dev/sda4		37890048	81788927	21949440	5	Extended
/dev/sda5		37894144	54278143	8192000	83	Linux
/dev/sda6		54280192	58376191	2048000	83	Linux
/dev/sda7		58378240	62474239	2048000	82	Linux swap / Solaris
/dev/sda8		37892096	37894143	1024	83	Linux
/dev/sda9		62476288	66381823	1952768	82	Linux swap / Solaris
/dev/sda10		66383872	66588671	102400	83	Linux
/dev/sda11		66590720	66795519	102400	83	Linux
/dev/sda12		66797568	67002367	102400	83	Linux
/dev/sda13		67004416	67209215	102400	83	Linux
/dev/sda14		67211264	67416063	102400	83	Linux

Partition table entries are not in disk order

#### 5. Create Meta disk by adding partitions or disks

##### Syntax:

```
[root@localhost~]# madam -C <meta_disk> -n <partition_1> <partition2> ... <partition_n>
-l<raid_level>
```

-C (create metadisk)

-n (number of partition or disk)

-l (Raid level)





```
[root@localhost~]# mdadm -C /dev/md0 -n3 /dev/sda11 /dev/sda12 /dev/sda13 -l5
```

**Result:**

```
mdadm: Defaulting to version 1.2 metadata
```

```
mdadm: array /dev/md0 started
```

**6. To see the detailed information of meta disk**

**Syntax:**

```
[root@localhost~]# mdadm -D <meta_disk>
```

```
[root@localhost~]# mdadm -D /dev/md0
```

```
/dev/md0:
```

```
Version : 1.2
Creation Time : Wed Sep 2 01:30:30 2015
Raid Level : raid5
Array Size : 203776 (199.03 MiB 208.67 MB)
Used Dev Size : 101888 (99.52 MiB 104.33 MB)
Raid Devices : 3
Total Devices : 3
Persistence : Superblock is persistent
```

```
Update Time : Wed Sep 2 01:30:37 2015
State : clean
Active Devices : 3
Working Devices : 3
Failed Devices : 0
Spare Devices : 0
```

```
Layout : left-symmetric
Chunk Size : 512K
```

```
Name : localhost.localdomain:0 (local to host localhost.localdomain)
```

```
UUID : daefa120:0538a29e:1741e5b5:e56c7017
```

```
Events : 18
```

Number	Major	Minor	RaidDevice	State
0	8	11	0	active sync /dev/sda11
1	8	12	1	active sync /dev/sda12
3	8	13	2	active sync /dev/sda13



## 7. Format the RAID meta disk

```
[root@localhost~]# mkfs.ext4 /dev/md0
```

### Result:

```
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=1024 (log=0)
Fragment size=1024 (log=0)
Stride=512 blocks, Stripe width=1024 blocks
51000 inodes, 203776 blocks
10188 blocks (5.00%) reserved for the super user
First data block=1
Maximum filesystem blocks=33816576
25 block groups
8192 blocks per group, 8192 fragments per group
2040 inodes per group
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729

Allocating group tables: done
Writing inode tables: done
Creating journal (4096 blocks): done
Writing superblocks and filesystem accounting information: done
```

## 8. Add a folder to mount the meta disk

```
[root@localhost~]# mkdir /raid
```

## 9. Mount the meta disk on directory to use

### Syntax:

```
[root@localhost~]# mount <meta_disk> <dir_name>
```

```
[root@localhost~]# mount /dev/md0 /raid
```

### Verification:

```
[root@localhost~]# mount | grep /raid
```

```
/dev/md0 on /raid type ext4 (rw,relatime,seclabel,stripe=1024,data=ordered)
```



**10. Enter into RAID mounted directory to add data**

```
[root@localhost~]# cd /raid
```

```
[root@localhost raid]# ls
```

**Result:**

```
lost+found:
```

**11. Write some content inside the RAID partition**

```
[root@localhost raid]# cat > test
```

```
hello this is a test file of raid 5 on Linux_v7
```

**ctrl+d (to save)**

**12. View the newly added file properties**

```
[root@localhost raid]# ls -l
```

**Result:**

```
-rw-r--r-- 1 root root 4 Aug 31 15:02 test
```

**13. To make the device faulty in RAID array**

**Syntax:**

```
[root@localhost~]# mdadm <meta_disk> -f <partition_no.>
```

```
[root@localhost~]# mdadm /dev/md0 -f /dev/sda12
```

```
mdadm: set /dev/sda12 faulty in /dev/md0
```

**14. To see the detailed information of /dev/md0 and check the faulty device which is displayed as spare.**

```
[root@localhost~]# mdadm -D /dev/md0
```

**Verification:**

```
/dev/md0:
```

```
Version : 1.2
```

```
Creation Time : Fri Aug 14 01:59:05 2015
```

```
Raid Level : raid5
```

```
Array Size : 224256 (219.04 MiB 229.64 MB)
```

```
Used Dev Size : 112128 (109.52 MiB 114.82 MB)
```



Raid Devices : 3  
Total Devices : 3  
Persistence : Superblock is persistent

Update Time : tue Sep 1 16:03:58 2015

State : clean, degraded

Active Devices : 2  
Working Devices : 2  
Failed Devices : 1  
Spare Devices : 0

Layout : left-symmetric  
Chunk Size : 512K

Name : client1:0 (local to host client)  
UUID : 96e0a496:a53aa9da:01e2b8f5:0a5bde05  
Events : 20

	Number	Major	Minor	RaidDevice	State
1	0	0	0	spare device	/dev/sda12
2	8	12	1	active sync	/dev/sda11
3	8	13	2	active sync	/dev/sda13

#### 15. To remove the faulty device

```
[root@localhostraid]# mdadm -r <meta_disk> <partition_no.>
```

```
[root@localhostraid]# mdadm /dev/md0 -r /dev/sda12
```

#### Result:

```
mdadm: hot removed /dev/sda12
```

#### 16. To view the status of meta disk

```
[root@localhostraid]# mdadm -D /dev/md0
```

```
/dev/md0:
```

```
Version : 1.2
```

```
Creation Time : tue Sep 1 16:13:45 2015
```

```
Raid Level : raid5
```

```
Array Size : 224256 (219.04 MiB 229.64 MB)
```

```
Used Dev Size : 112128 (109.52 MiB 114.82 MB)
```

```
Raid Devices : 3
```

```
Total Devices : 2
```



Persistence : Superblock is persistent

Update Time : Fri Aug 14 02:03:58 2015

State : clean, degraded

Active Devices : 2

Working Devices : 2

Failed Devices : 0

Spare Devices : 0

Layout : left-symmetric

Chunk Size : 512K

Name : web.zoomgroup.com:0 (local to host web.zoomgroup.com)

UUID : 96e0a496:a53aa9da:01e2b8f5:0a5bde05

Events : 20

Number	Major	Minor	RaidDevice	State
0	0	0	0	removed
1	8	12	1	active sync /dev/sda11
3	8	13	2	active sync /dev/sda13

[root@localhostraidd\_dir]# cd

## 17. To add new device into RAID

### Syntax:

[root@localhost~]# mdadm -a <meta\_disk> <partition\_no.>

[root@localhost~]# mdadm -a /dev/md0 /dev/sda14

### Verification:

mdadm: added /dev/sda14

[root@web ~]# mdadm -D /dev/md0

/dev/md0:

Version : 1.2

Creation Time : Fri Aug 14 01:59:05 2015

Raid Level : raid5

Array Size : 224256 (219.04 MiB 229.64 MB)

Used Dev Size : 112128 (109.52 MiB 114.82 MB)

Raid Devices : 3

Total Devices : 3

Persistence : Superblock is persistent

Update Time : Fri Aug 14 02:08:20 2015





State : clean, degraded, recovering  
Active Devices : 2  
Working Devices : 3  
Failed Devices : 0  
Spare Devices : 1  
Layout : left-symmetric  
Chunk Size : 512K  
Rebuild Status : 40% complete  
Name : web.zoomgroup.com:0 (local to host web.zoomgroup.com)  
UUID : 96e0a496:a53aa9da:01e2b8f5:0a5bde05  
Events : 42

Number	Major	Minor	RaidDevice	State
4	8	15	0	spare rebuilding /dev/sda14
1	8	12	1	active sync /dev/sda12
3	8	13	2	active sync /dev/sda13

**18. Unmount the meta device before you stop the RAID.**

**Syntax:**

[root@localhost~]# umount <meta\_disk>

[root@localhost~]# umount /dev/md0

**19. To stop the RAID**

**Syntax:**

[root@localhost~]# mdadm -S <meta\_disk>

[root@localhost~]# mdadm -S /dev/md0

**Result:**

mdadm: stopped /dev/md0

**20. To activate or assemble the RAID meta device**

**Syntax:**

[root@localhost~]# mdadm -A /dev/md0 <disk\_1> <disk\_2> <disk\_3>

[root@localhost~]# mdadm -A /dev/md0 /dev/sda11 /dev/sda13 /dev/sda14

**Result:**

mdadm: /dev/md0 has been started with 3 drives.





## LAB 17: BACKUP AND RESTORE USING TAR AND FILTER THE ARCHIVE THROUGH GZIP(-z)

### OBJECTIVE:

To take Backup using tar and filter the archive through gzip

### PRE-REQUISITE:

Machine with Linux Installed

### TOPOLOGY:



1. Create a folder along with some other directories and files

```
[root@localhost ~]# mkdir /myfolder  
[root@localhost ~]# cd /myfolder/  
[root@localhost myfolder]# mkdir dir1  
[root@localhost myfolder]# touch 1 test_file tom_file  
[root@localhost myfolder]# ls  
dir1 test_file tom_file
```

2. To take a backup and compress the file

**Syntax:**

```
[root@localhost ~]# tar <options> <file_name.tar.gz> <source_files/folders>  
  
-c create  
-v verbose  
-f filename  
-z compress the backup file
```

```
[root@localhost ~]# tar -cvzf myfolder.tar.gz /myfolder
```

**Result:**

```
tar: Removing leading '/' from member names  
/myfolder/  
/myfolder/dir1/  
/myfolder/tom_file  
/myfolder/test_file  
/myfolder/1
```

**Verification:**

```
[root@localhost ~]# ls -ld myfolder.tar.gz  
-rw-r--r-- 1 root root 251 Jul 13 03:09 myfolder.tar.gz
```

3. To view the contents of the backup file

**Syntax:**

```
[root@localhost ~]# tar <options> <file_name.tar.gz>  
[root@localhost ~]# tar -tvzf myfolder.tar.gz
```



**Result:**

```
drwxrwxrwx root/root      0 2008-07-13 01:31:34 myfolder/
drwxr-xr-x root/root      0 2008-07-13 01:28:39 myfolder/dir1/
-rw-r--r-- tom/john      12 2008-07-13 01:29:51 myfolder/tom_file
-rw-rw-rw- root/root      0 2008-07-13 00:06:35 myfolder/test_file
-rw-r--r-- tom/john      0 2008-07-13 01:31:34 myfolder/1
```

**4. To test the backup, delete the source folder data**

```
[root@localhost ~]# rm -r /myfolder
```

**Result:**

```
rm: descend into directory `/myfolder'? y
rm: remove directory `/myfolder/dir1'? y
rm: remove regular file `/myfolder/tom_file'? y
rm: remove regular empty file `/myfolder/test_file'? y
rm: remove regular empty file `/myfolder/1'? y
rm: remove directory `/myfolder'? y
```

**5. To restore the data****Syntax:**

```
[root@localhost ~]# tar <options> <file_name.tar.gz> -C <new_dir>
```

```
[root@localhost ~]# tar -xvzf /root/myfolder.tar.gz -C /
```

**Result:**

```
myfolder/
myfolder/dir1/
myfolder/tom_file
myfolder/test_file
myfolder/1
```

**Verification:**

```
[root@localhost /]# ls /myfolder
```

**Result:**

```
1 dir1 test_file tom_file
```



## LAB 18: BACKUP AND RESTORE USING TAR AND FILTER THE ARCHIVE THROUGH BZIP2(-j)

### OBJECTIVE:

To take Backup using tar and filter the archive through bzip2

### PRE-REQUISITE:

Machine with Linux Installed

### TOPOLOGY:



### 1. To backup data

**Syntax:**

```
[root@localhost ~]# tar <options> <destination_file> <source_file.tar.bz2>
```

```
[root@localhost ~]# tar -cvjf /mnt/etc.tar.bz2 /etc
```

**Result:**

```
tar: Removing leading '/' from member names
```

```
/etc/
```

```
/etc/motd
```

```
/etc/os-release
```

```
/etc/sssd/
```

```
/etc/favicon.png
```

```
/etc/auto.master.d/
```

```
/etc/smartmontools/
```

```
/etc/smartmontools/smartd_warning.d/
```

### 2. To check the backup data

**Syntax:**

```
[root@localhost ~]# tar -<options> <destination_file.tar.bz2> <source_dir>
```

```
[root@localhost ~]# tar -tvjf /mnt/etc.tar.bz2 /etc
```

**Result:**

```
drwxr-xr-x root/root    0 2015-09-01 12:51 etc/
```

```
-rw-r--r-- root/root    0 2013-06-07 20:01 etc/motd
```

```
-rw-r--r-- root/root  254 2014-07-04 16:30 etc/os-release
```

```
drwx----- root/root    0 2014-06-17 23:12 etc/sssd/
```

### 3. To restore data if it is lost

**Syntax:**

```
[root@localhost ~]# tar -xvjf <destination_file.bz2> -C <new_dir>
```

```
[root@localhost ~]# tar -xvjf /mnt/etc.tar.bz2 -C /opt
```

**Result:**

```
etc/
```

```
etc/motd
```

```
etc/os-release
```



```
etc/sss/
etc/favicon.png
etc/auto.master.d/
etc/smartmontools/
etc/smartmontools/smartd_warning.d/
```

**4. Check the original data and backup file size**

```
[root@localhost ~]# du -sh /etc
```

**Result:**

```
31M    /etc
```

```
[root@localhost~]# du -sh /mnt/etc.tar.bz2
```

**Result:**

```
6.7M    /mnt/etc.tar.bz2
```

Note : Size difference between original and backup file.





## LAB 19: BACKUP AND RESTORE USING CPIO COMMAND

**OBJECTIVE:**

To take Backup using cpio command

**PRE-REQUISITE:**

Machine with Linux Installed

**TOPOLOGY:**

1. Enter into source directory from where you want the backup to be taken

```
[root@localhost~]# cd /myfolder
```

2. To take backup of filtered output

**Syntax:**

```
[root@localhost ~]# <list files/folders> | cpio -ov > <destination/backup_file.cpio>
```

-o out

-v verbose

-t table of content

-l in

```
[root@localhost myfolder]# ls -d | cpio -ov > /mnt/zoom.cpio
```

**Result:**

```
1
dir1
myfolder.cpio
test_file
tom_file
1 block
```

3. To view content of backup file

**Syntax:**

```
[root@localhost]# cpio -tf < <destination_file>
```

```
[root@localhost]# cpio -tf < /mnt/zoom.cpio
```

**Result:**

```
1
dir1
test_file
tom_file
1 block
```



4. To test backup file by removing the original folder data

```
[root@localhost myfolder]# rm -r *
```

**Verification:**

```
rm: remove regular empty file `1'? y
```

```
rm: remove directory `dir1'? y
```

```
rm: remove regular file `myfolder.cpio'? n
```

```
rm: remove regular empty file `test_file'? y
```

```
rm: remove regular file `tom_file'? y
```

5. To restore data into present working directory.

```
[root@localhost myfolder]# cpio -iv < <destination_dir/file>
```

```
[root@localhost myfolder]# cpio -iv < /mnt/zoom.cpio
```

**Verification:**

```
1
```

```
dir1
```

```
test_file
```

```
tom_file
```

```
1 block
```

6. To check restored data

```
[root@localhost ~]# ls myfolder
```

**Result:**

```
1 dir test_file tom_file
```



## LAB 20: NETWORK CONFIGURATION- IP ADDRESSING

### OBJECTIVE:

To enable network communication between computers by assigning IP addresses.

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



1. To set the hostname temporarily

**Syntax:**

```
[root@localhost ~]# hostname <system_name>
```

```
[root@localhost ~]# hostname sys1.zoomgroup.com
```

2. To view the hostname

```
[root@localhost~]# hostname
```

```
sys1.zoomgroup.com
```

3. To set hostname permanently add in the following file

```
[root@sys1~]# vi /etc/hostname
```

```
sys1.zoomgroup.com
```

```
:wq!
```

4. To map ip and hostname locally add in following file

```
[root@sys1~]# vi /etc/hosts
```

```
127.0.0.1 Localhost.localdomain localhost
```

```
192.168.0.1 sys1.zoomgroup.com sys1
```

```
:wq!
```

**Note:** To update new configuration to kernel log out and log in to the operating system

5. Set ip address temporarily

**Syntax:**

```
[root@sys1~]# ifconfig <network_device_name> <IP address> netmask <netmask_value>
```

```
[root@sys1~]# Ifconfig enp1s7 192.168.0.9 netmask 255.255.255.0
```



## 6. View the interface details.

```
[root@sys1~]# ifconfig
```

### Result:

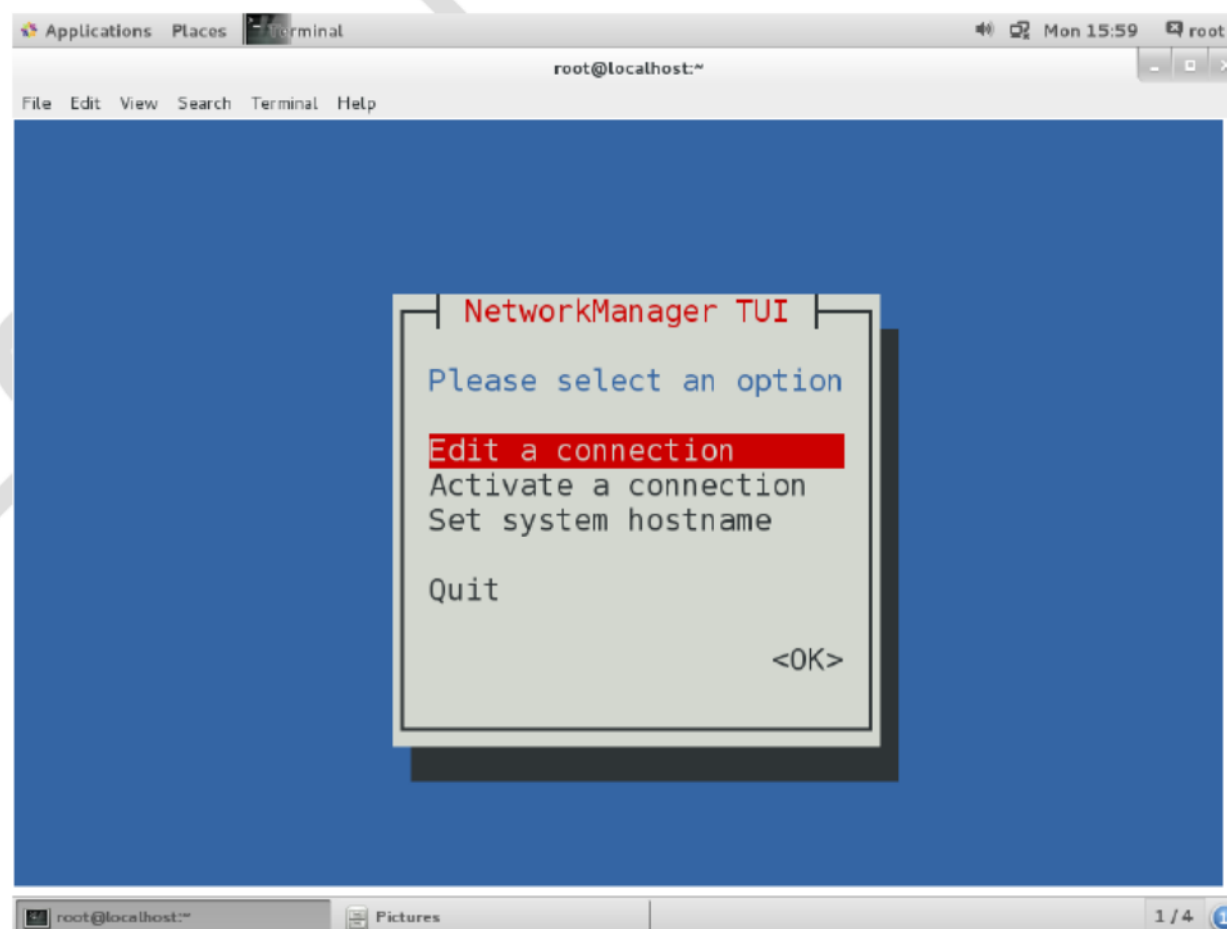
```
enp1s7 Link encap:Ethernet HWaddr 00:13:20:B7:1D:44
    inet addr:192.168.0.9 Bcast:192.168.0.255
    Mask:255.255.255.0
    inet6 addr: fe80::213:20ff:feb7:1d44/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
    RX packets:48153 errors:4 dropped:0 overruns:0 frame:4
    TX packets:21992 errors:0 dropped:0 overruns:0 carrier:0
    collisions:0 txqueuelen:1000
    RX bytes:39512670 (37.6 MiB) TX bytes:1720318 (1.6 MiB)

lo    Link encap:Local Loopback
    inet addr:127.0.0.1 Mask:255.0.0.0
    inet6 addr: ::1/128 Scope:Host
    UP LOOPBACK RUNNING MTU:16436 Metric:1
    RX packets:1249 errors:0 dropped:0 overruns:0 frame:0
```

## 7. To set permanent ip address

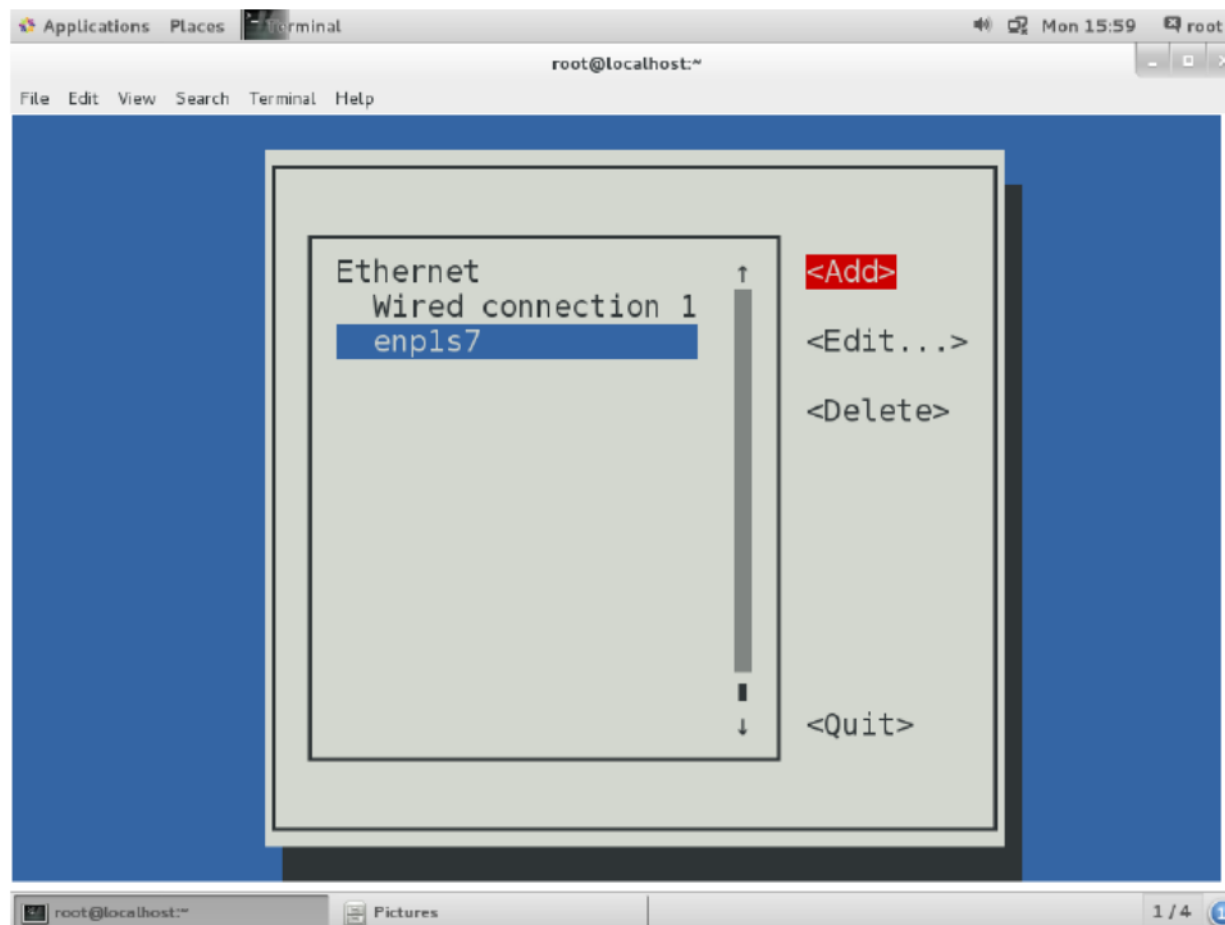
```
[root@sys1~]# nmtui
```

- **Select Edit a connection**

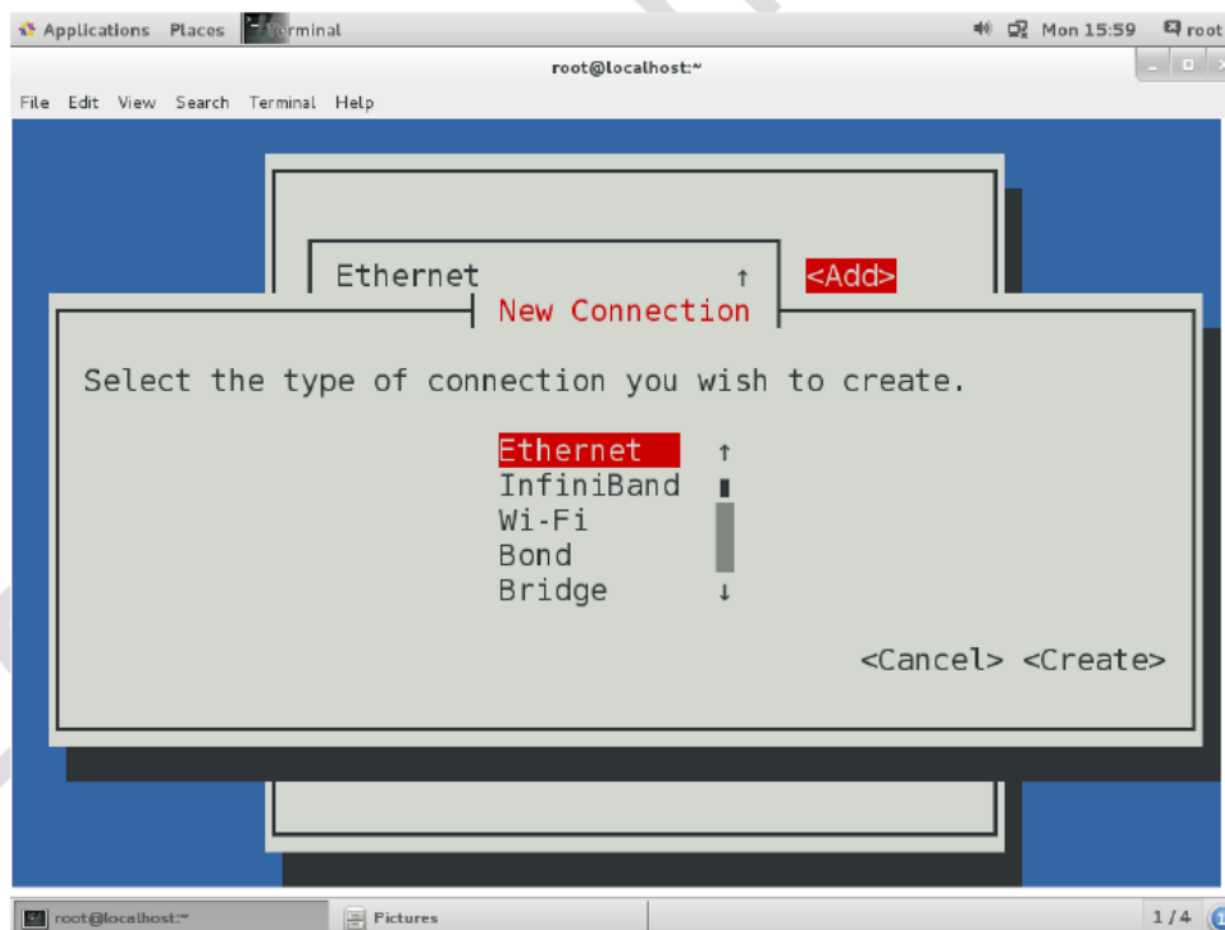




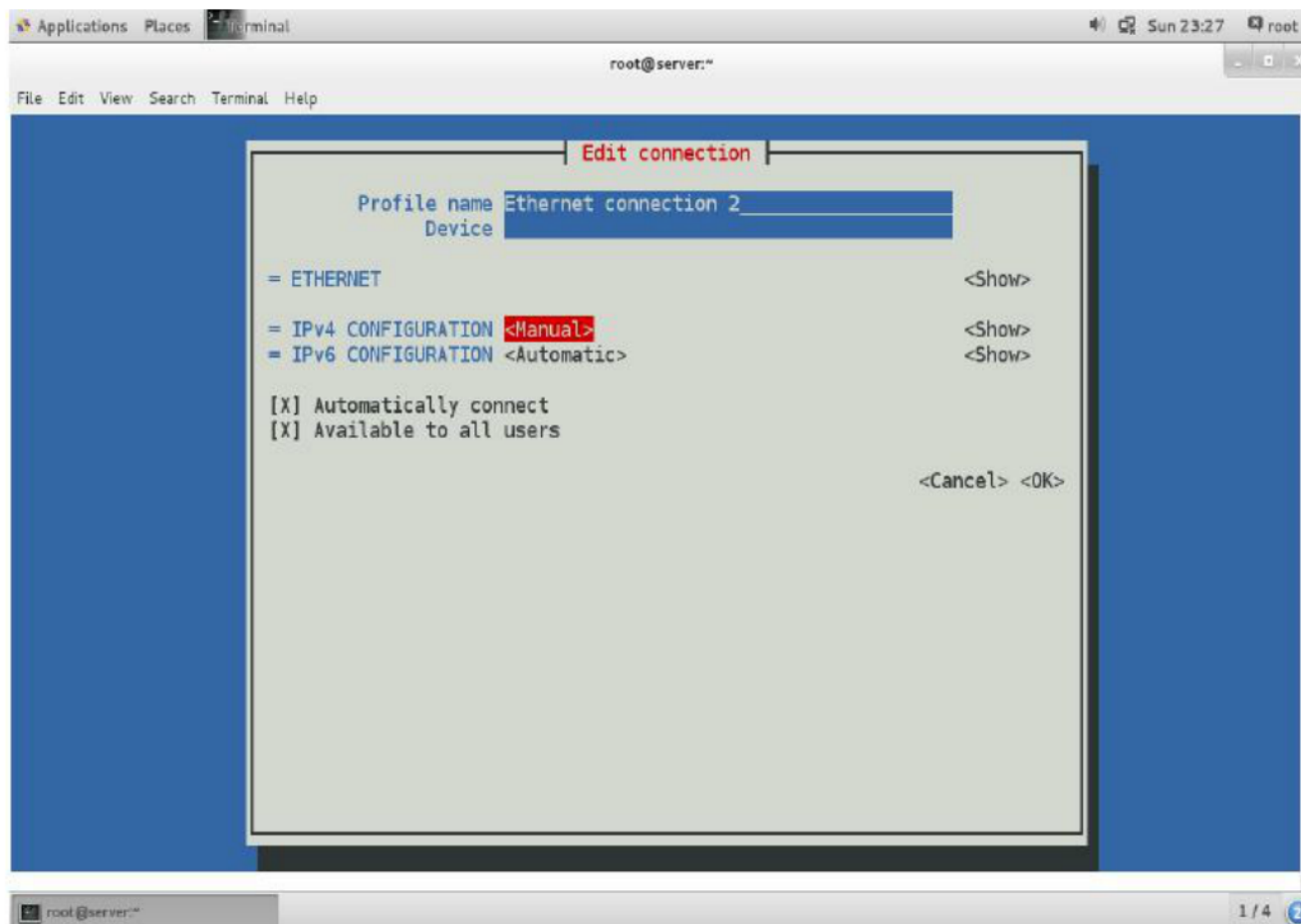
- **Select device and Add option**



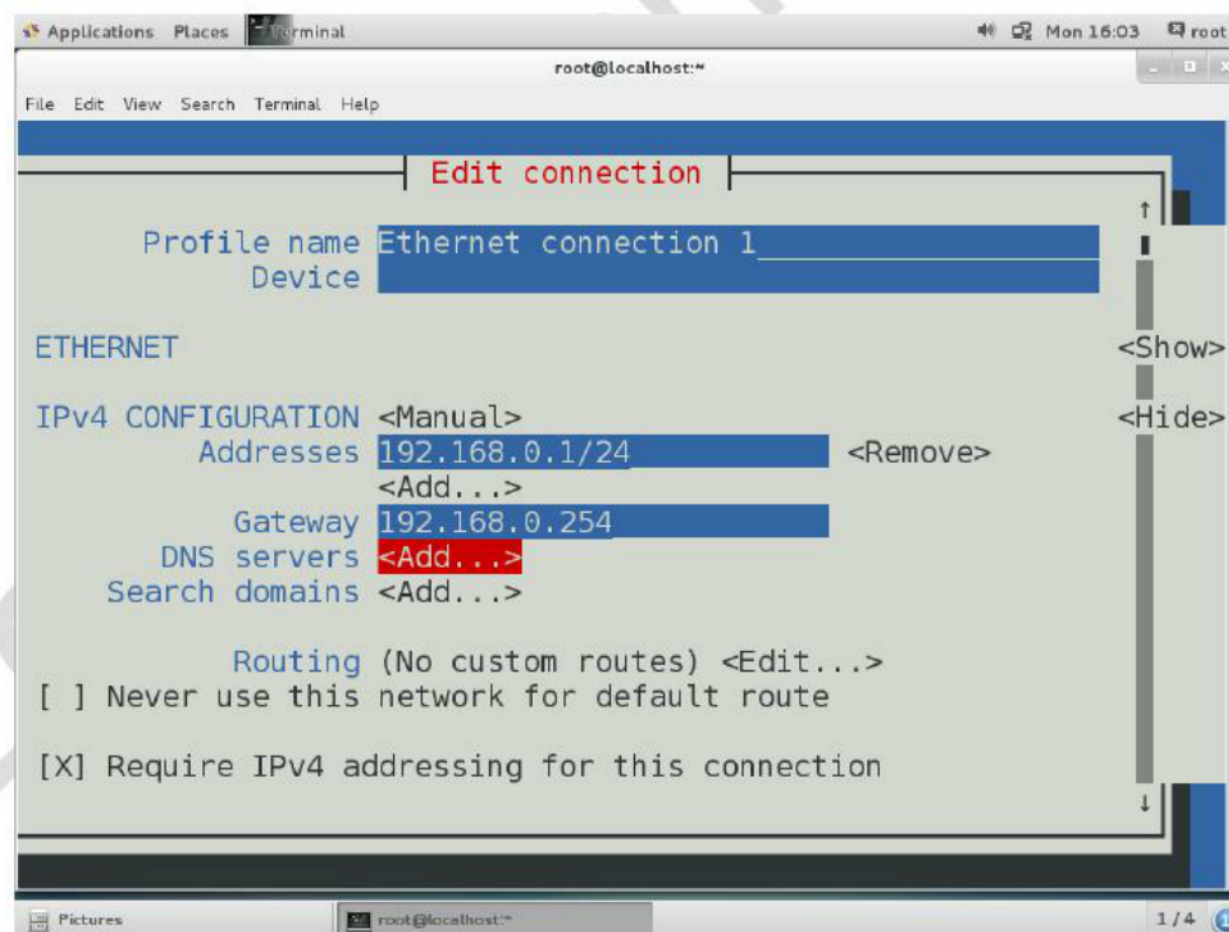
- **Add Ethernet Device**



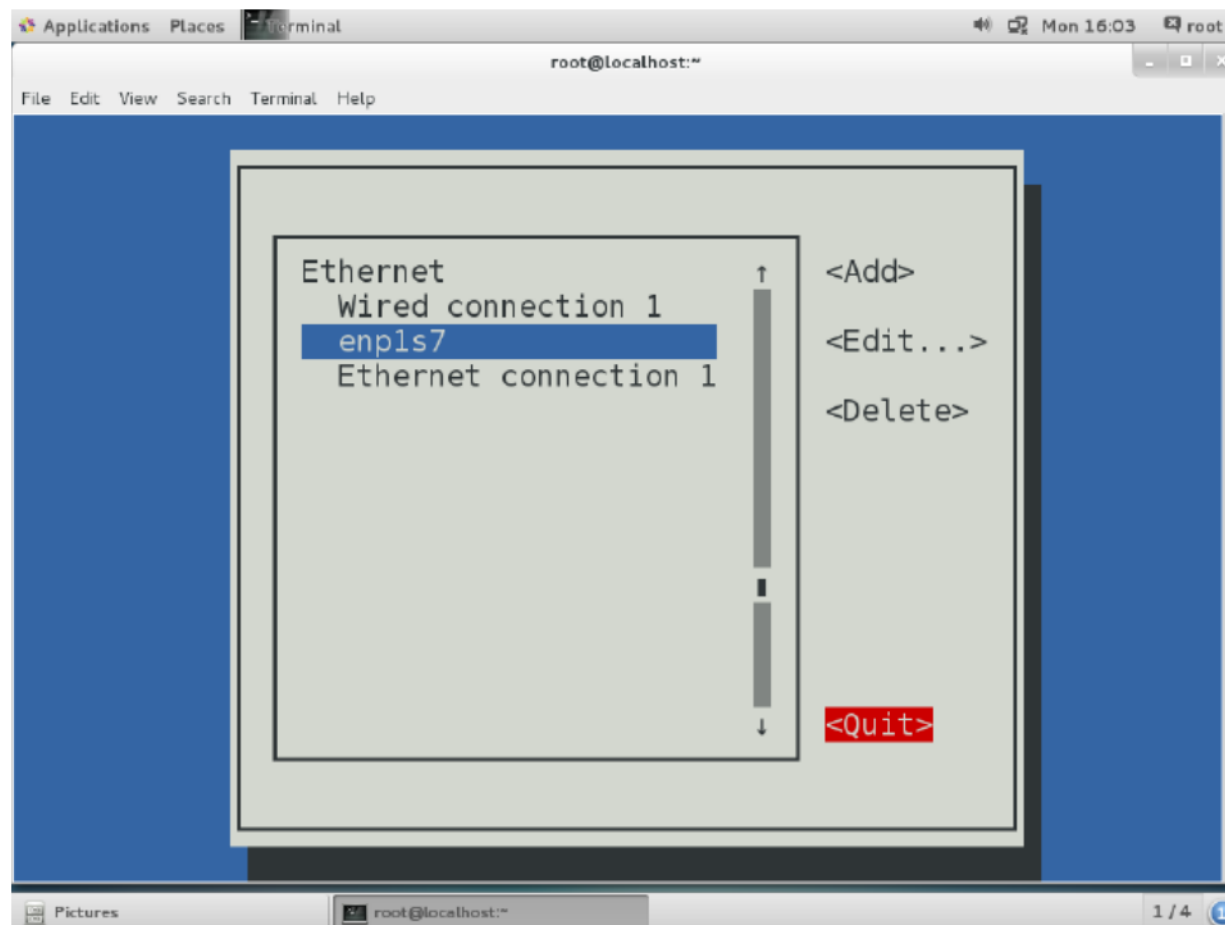
- **Select Static(Manual Method)**



- **Configure IP address , DNS server and gateway**



- **Select quit to proceed**



8. **Restart the service to activate the newly configured ip address**

**Syntax:**

```
[root@sys1~]# <commad> <service_name> <action>
```

```
[root@sys1~]# service network restart
```

OR

```
[root@sys1~]# systemctl enable network
```

9. **To view new ip address**

```
[root@sys1~]# ifconfig
```

```
enp1s7 Link encap:Ethernet HWaddr 00:13:20:B7:1D:44
inet addr:192.168.0.1 Bcast:192.168.0.255 Mask:255.255.255.0
inet6 addr: fe80::213:20ff:feb7:1d44/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:48153 errors:4 dropped:0 overruns:0 frame:4
TX packets:21992 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:39512670 (37.6 MiB) TX bytes:1720318 (1.6 MiB)
```

```
lo    Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
```

inet6 addr: ::1/128 Scope:Host  
UP LOOPBACK RUNNING MTU:16436 Metric:

#### 10. To Enable the NIC card

**Syntax:**

```
[root@sys1~]# ifup <network_device_name>
```

```
[root@sys1~]# ifup enp1s7
```

**Verification:**

```
[root@sys1~]# ifconfig
```

```
enp1s7: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
  inet 192.168.0.1 netmask 255.255.255.0 broadcast 192.168.0.255  
  inet6 fe80::20c:29ff:fe6a:f2a6 prefixlen 64 scopeid 0x20<link>  
  ether 00:0c:29:6a:f2:a6 txqueuelen 1000 (Ethernet)  
  RX packets 25428 bytes 19635570 (18.7 MiB)  
  RX errors 0 dropped 0 overruns 0 frame 0  
  TX packets 17895 bytes 4108956 (3.9 MiB)  
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

#### 11. To Disable NIC card

**Syntax:**

```
[root@sys1~]# ifdown <network_device_name>
```

```
[root@sys1~]# ifdown enp1s7
```

**Verification:**

```
[root@sys1~]# ifconfig
```

```
enp1s7: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
  ether 00:0c:29:6a:f2:a6 txqueuelen 1000 (Ethernet)  
  RX packets 25377 bytes 19628872 (18.7 MiB)  
  RX errors 0 dropped 0 overruns 0 frame 0  
  TX packets 17711 bytes 4093938 (3.9 MiB)  
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

#### 12. To Remove an ip address ,remove the configuration file

```
[root@sys1~]# cd /etc/sysconfig/network-scripts/
```



```
[root@sys1network-scripts]# ls
```

**Result:**

```
ifcfg-enp1s7  ifdown-isdn  ifup-ipsec  ifup-routes
ifcfg-lo      ifdown-ppp    ifup-ipx    ifup-sl
ifdown        ifdown-sit    ifup-isdn   ifup-wireless
ifdown-aliases ifdown-sl     ifup-plip   init.ipv6-global
ifdown-ipppp  ifup          ifup-plusb  network-functions
ifdown-ipsec  ifup-aliases  ifup-post   network-functions-ipv6
ifdown-ipv6   ifup-ipppp    ifup-ppp
```

```
[root@sys1network-scripts]# cat ifcfg- enp1s7
```

**Result:**

```
DEVICE=enp1s7
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.0.1
NETMASK=255.255.255.0
GATEWAY=192.168.0.254
```

```
[root@sys1network-scripts]# rm -rf ifcfg- enp1s7
```

**Verification:**

```
[root@sys1network-scripts]# ls
```

```
ifcfg-lo      ifdown-ppp    ifup-ipx    ifup-sl
ifdown        ifdown-sit    ifup-isdn   ifup-wireless
ifdown-aliases ifdown-sl     ifup-plip   init.ipv6-global
ifdown-ipppp  ifup          ifup-plusb  network-functions
ifdown-ipsec  ifup-aliases  ifup-post   network-functions-ipv6
ifdown-ipv6   ifup-ipppp    ifup-ppp
```

**Note:** ifcfg-enp1s7 file is removed

**13. To update ip changes start/restart the services**

```
[root@sys1network-scripts]# service network restart
```

#### OR #####

```
[root@sys1network-scripts]# systemctl enable network
```





## LAB 21: PACKAGE MANAGEMENT (RPM COMMAND)

### OBJECTIVE:

To install packages using RPM command

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:





## To install packages from dvd

1. To query whether package is installed or not

**Syntax:**

```
[root@client ~]# rpm -q <package_name>
```

```
[root@client ~]# rpm -q zip
```

**Result:**

```
zip-3.0-10.el7.x86_64
```

2. To remove the installed package

**Syntax:**

```
[root@client ~]# rpm -e <package_name>
```

```
[root@client ~]# rpm -e zip -- nodeps
```

```
[root@client ~]# rpm -q zip
```

**Result:**

```
Package zip is not installed
```

3. Insert dvd and mount it on dir

```
[root@client ~]# mount /dev/sr0 /media
```

```
mount: /dev/sr0 is write-protected, mounting read-only
```

4. To verify mount point of dvd

```
[root@client ~]# mount
```

**Verification:**

```
/dev/sda5 on / type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda2 on /usr type ext4 (rw,relatime,seclabel,data=ordered)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
/dev/sda9 on /disk9 type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda1 on /boot type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda6 on /home type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda3 on /var type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sr0 on /media type iso9660
(ro,relatime,uid=0,gid=0,ioccharset=utf8,mode=0400,dmode=0500)
```



5. Go to dvd mount point to install packages.

```
[root@client]# cd /media/Packages
```

```
[root@client]# ls
```

**Result:**

Displays the list of all packages with extension .rpm

6. To install , to view verbose output, and to check the progress of installation of packages with hash sign.

**Syntax :**

```
[root@client]# rpm <option> <package_name.rpm>
```

-i install

-v verbose

-h to see the installation progress with hash

--force to install package forcefully if it is already installed

```
[root@client]# rpm -ivh zip*.rpm
```

**Verification:**

Warning: zip-3.0-10.el7.x86\_64.rpm: Header V3 RSA/SHA256 Signature, key ID f4a80eb5:

NOKEY

Preparing... ##### [100%]

Updating / installing...

1: zip-3.0-10.el7 ##### [100%]



## To install packages from server by using 'NFS' service

1. To query package is installed or not

```
[root@client ~]# rpm -q vsftpd
```

### Verification:

```
vsftpd-3.0-10.el7.x86_64
```

2. If package is installed remove it

```
[root@client ~]# rpm -e vsftpd
```

3. Mount a share folder of NFS share folder in linux client system

```
[root@client ~]# mount 192.168.0.250:/var/ftp/pub/centos7/Packages /mnt
```

```
[root@client ~]# mount
```

### Verification:

```
/dev/sda5 on / type ext4 (rw,relatime,seclabel,data=ordered)
```

```
/dev/sda2 on /usr type ext4 (rw,relatime,seclabel,data=ordered)
```

```
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
```

```
192.168.0.250:/var/ftp/pub/centos7/Packages on /mnt type nfs  
(rw,relatime,seclabel,data=ordered)
```

```
/dev/sda1 on /boot type ext4 (rw,relatime,seclabel,data=ordered)
```

```
/dev/sda6 on /home type ext4 (rw,relatime,seclabel,data=ordered)
```

```
/dev/sda3 on /var type ext4 (rw,relatime,seclabel,data=ordered)
```

```
[root@client ~]# cd /mnt
```

```
[root@client ~]# ls
```

### Verification:

Displays the list of all packages with rpm extension.



#### 4. To install packages forcefully if package is already installed

##### Syntax:

```
[root@client mnt]# rpm -ivh <package_name> --force
```

```
[root@client mnt]# rpm -ivh vsftpd*.rpm --force
```

##### Result:

```
Warning: vsftpd-3.0-10.el7.x86_64.rpm: Header V3 RSA/SHA256 Signature, key ID f4a80eb5:
NOKEY
```

```
Preparing... ##### [100%]
```

```
Updating / installing...
```

```
1: vsftpd-3.0-10.el7 ##### [100%]
```

#### To query the packages with some more options of rpm

##### 1. To query all installed packages whose name starts with word samba

##### Syntax:

```
[root@client mnt]# rpm -qa <package_name>
```

```
[root@client mnt]# rpm -qa samba*
```

##### Verification:

```
samba-client-4.1.1-31.el7.x86_64
samba-libs-4.1.1-31.el7.x86_64
samba-4.1.1-31.el7.x86_64
samba-common-4.1.1-31.el7.x86_64
```

##### 2. To query the information of any package

##### Syntax:

```
[root@client mnt]# rpm -qi <package_name>
```

```
[root@client mnt]# rpm -qi samba
```

##### Result:

```
Name      : samba
Epoch    : 0
Version   : 4.1.1
Release   : 31.el7
Architecture: x86_64
Install Date: Mon 31 Aug 2015 01:39:38 AM IST
Group     : System Environment/Daemons
Size      : 1616509
```



License : GPLv3+ and LGPLv3+  
Signature : RSA/SHA256, Fri 04 Jul 2014 10:23:17 AM IST, Key ID 24c6a8a7f4a80eb5  
Source RPM : samba-4.1.1-31.el7.src.rpm  
Build Date : Tue 17 Jun 2014 11:20:16 PM IST  
Build Host : worker1.bsys.centos.org  
Relocations : (not relocatable)  
Packager : CentOS BuildSystem <<http://bugs.centos.org>>  
Vendor : CentOS  
URL : <http://www.samba.org/>  
Summary : Server and Client software to interoperate with Windows machines  
Description :  
Samba is the standard Windows interoperability suite of programs for Linux and Unix.

### 3. To query the list of all files of particular package

#### **Syntax:**

```
[root@client mnt]# rpm -ql <package_name>
```

```
[root@client mnt]# rpm -ql samba
```

#### **Result:**

```
/etc/openldap/schema  
/etc/openldap/schema/samba.schema  
/usr/bin/eventlogadm  
/usr/bin/smbstatus  
..  
..  
/usr/share/man/man8/vfs_tsm8.8.gz  
/usr/share/man/man8/vfs_xattr_tdb.8.gz  
/var/spool/samba
```

### 4. To query package related documentation and man pages

#### **Syntax:**

```
[root@client mnt]# rpm -qd <package_name>
```

```
[root@client mnt]# rpm -qd samba
```

#### **Result:**

```
/usr/share/doc/samba-4.1.1/COPYING  
/usr/share/doc/samba-4.1.1/LDAP/README  
/usr/share/doc/samba-4.1.1/LDAP/get_next_oid  
/usr/share/doc/samba-4.1.1/LDAP/ol-schema-migrate.pl
```





## 5. To query package configuration files

### Syntax:

```
[root@client mnt]# rpm -qc <package_name
```

```
[root@localhost ~]# rpm -qc samba-common
```

### Result:

```
/etc/logrotate.d/samba
```

```
/etc/samba/lmhosts
```

```
/etc/samba/smb.conf
```

```
/etc/sysconfig/samba
```





## LAB 22: PACKAGE MANAGEMENT (YUM COMMAND)

### OBJECTIVE:

To install packages using YUM command

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



**Note:** In Labs 'YUM' Server has been already configured.

At client side edit the yum configuration file by providing the server ip-address and package directory path as follow.

1. Provide the YUM server IP address and package directory name in yum file

```
[root@client ~]# vi /etc/yum.repos.d/CentOS-Base.repo
```

```
[core]
```

```
name= Linux $releasever - $basearch - Debug
```

```
baseurl=ftp://192.168.0.250/pub/centos7/Packages
```

```
enabled=1
```

```
gpgcheck=1
```

```
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
```

2. To see the list of packages available in repository i.e on yum server

#### Syntax:

```
[root@client ~]# yum list <package_name>
```

```
[root@client ~]# yum list samba*
```

#### Verification:

Loaded plugins: fastestmirror, refresh-package kit, security

Loading mirror speeds from cached hostile

```
core | 1.2 kB 00:00
```

#### **Installed Packages**

samba.x86_64	3.5.10-125.el6	@core
samba-client.x86_64	3.5.10-125.el6	@core
samba-common.x86_64	3.5.10-125.el6	@core
samba-doc.x86_64	3.5.10-125.el6	@core
samba-domainjoin_64	3.5.10-125.el6	@core
samba-swat.x86_64	3.5.10-125.el6	@core
samba-winbind.x86_64	3.5.10-125.el6	@core
samba4-pidl.x86_64	4.0.0-23.alpha11.el6	@core

#### **Available Packages**

samba-common.i686	3.5.10-125.el6	core
samba-winbind-clients.i686	3.5.10-125.el6	core
samba-winbind-devel.i686	3.5.10-125.el6	core



### 3. To install packages

#### Syntax:

```
[root@ client ~]# yum install <package_name> -y
```

```
[root@ client ~]# yum install samba* -y
```

Loaded plugins: fastest mirror, refresh-package kit, security

Setting up Install Process

Package samba-winbind-krb5-locator-3.5.10-125.el6.x86\_64 already

Package samba-winbind-3.5.10-125.el6.x86\_64 already installed and latest version

Package samba-winbind-clients-3.5.10-125.el6.x86\_64 already installed and latest version

Resolving Dependencies

--> Running transaction check

---> Package samba.x86\_64 0:3.5.10-125.el6 will be installed

Dependency Installed:

xinetd.x86\_64 2:2.3.14-34.el6

Complete!

### 4. To see the list of installed packages in the local system

```
[root@client ~]# yum list installed samba*
```

#### Verification:

Loaded plugins: fastestmirror, refresh-packagekit, security

Loading mirror speeds from cached hostfile

Installed Packages

samba.x86_64	3.5.10-125.el6
samba-client.x86_64	3.5.10-125.el6
samba-common.x86_64	3.5.10-125.el6
samba-doc.x86_64	3.5.10-125.el6
samba-domainjoin-gui.x86_64	3.5.10-125.el6
samba-swat.x86_64	3.5.10-125.el6
samba-winbind.x86_64	3.5.10-125.el6
samba-winbind-clients.x86_64	3.5.10-125.el6
samba-winbind-devel.x86_64	3.5.10-125.el6
samba-winbind-krb5-locator.x86_64	3.5.10-125.el6



## LAB 23: DHCP SERVER

### OBJECTIVE:

To provide Dynamic IP address to clients with a DHCP server

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



## DHCP Server Configuration

1. Check whether the packages are installed or not

```
[root@dhcp ~]# rpm -qa dhcp-*
```

### Result:

```
dhcp-libs-4.2.5-27.el7.centos.x86_64
dhcp-common-4.2.5-27.el7.centos.x86_64
dhcp-4.2.5-27.el7.centos.x86_64
```

2. If packages are installed, remove them

```
[root@dhcp ~]# rpm -e dhcp-libs dhcp-common dhcp --nodeps
```

Note : While removing only give the name of packages, don't use yum otherwise dependencies will be also get removed.

3. To Install the packages

```
[root@dhcp ~]# yum install dhcp-* -y
```

### Result:

```
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
Resolving Dependencies
--> Running transaction check
---> Package dhcp.x86_64 12:4.2.5-27.el7.centos will be installed
---> Package dhcp-common.x86_64 12:4.2.5-27.el7.centos will be installed
---> Package dhcp-libs.x86_64 12:4.2.5-27.el7.centos will be installed
--> Finished Dependency Resolution
```

Install 3 Packages

Total download size: 801 k

Installed size: 1.8 M

Downloading packages:

```
-----
Total                                                    88 MB/s | 801
kB 00:00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
Warning: RPMDB altered outside of yum.
```





Installed:

dhcp.x86\_64 12:4.2.5-27.el7.centos  
dhcp-libs.x86\_64 12:4.2.5-27.el7.centos

dhcp-common.x86\_64 12:4.2.5-27.el7.centos

Complete!

#### 4. Copy the sample dhcp configuration file

```
[root@dhcp ~]# cp -rv /usr/share/doc/dhcp-4.2.5/dhcpd.conf.example
/etc/dhcp/dhcpd.conf
```

#### 5. Edit the Main Configuration File

```
[root@dhcp ~]# vi /etc/dhcp/dhcpd.conf
```

##### Verification:

# A slightly different configuration for an internal subnet.

```
subnet 192.168.0.0 netmask 255.255.255.0 {
    range 192.168.0.1 192.168.0.200;
    option domain-name-servers 192.168.0.253;
    option domain-name "zoomgroup.com";
    option routers 192.168.0.254;
    default-lease-time 600;
    max-lease-time 7200;
```

## Network ID  
## pool of IP address  
## DNS IP  
## DNS Name  
## Gateway or Router IP

```
Host fantasia {
    Hardware ethernet 08:00:07:26:c0:a5;
    Fixed-address 192.168.0.200;
}
```

## fixed ip-address or DHCP  
## reservation or  
## mac binding

#### 6. Start the services

```
[root@dhcp ~]# service dhcpd restart
```

##### Result:

Redirecting to /bin/systemctl restart dhcpd.service

#### OR ####

```
[root@dhcp ~]# systemctl enable dhcpd
```

##### Result:

```
ln -s '/usr/lib/systemd/system/dhcpd.service' '/etc/systemd/system/multi-
user.target.wants/dhcpd.service'
```





## DHCP Client Configuration

1. Select DHCP in nmtui command

```
[root@client ~]# nmtui
```

Select

Edit a connection => Ethernet name => IPv4 CONFIGURATION <Automatic>

2. To view DORA PROCESS and also get Dynamic IP-Address

```
[root@client ~]# dhclient -v
```

**Verification:**

Internet Systems Consortium DHCP Client 4.2.5

Copyright 2004-2013 Internet Systems Consortium.

All rights reserved.

For info, please visit <https://www.isc.org/software/dhcp/>

Listening on LPF/enp1s7/00:0c:29:df:d3:51

Sending on LPF/enp1s7/00:0c:29:df:d3:51

Sending on Socket/fallback

DHCPDISCOVER on enp1s7 to 255.255.255.255 port 67 interval 5 (xid=0x4d83e522)

DHCPREQUEST on enp1s7 to 255.255.255.255 port 67 (xid=0x4d83e522)

DHCPOFFER from 192.168.0.252

DHCPACK from 192.168.0.252 (xid=0x4d83e522)

bound to 192.168.0.200 -- renewal in 742 seconds.

3. Start the service

```
[root@client ~]# service network restart
```

#### OR ####

```
[root@client ~]# systemctl enable network
```

4. To verify IP-Address

```
[root@client ~]# ifconfig
```

**Verification:**

enp1s7 Link encap:Ethernet HWaddr 00:13:20:B7:1D:44

inet addr:192.168.0.200 Bcast:192.168.0.255 Mask:255.255.255.0

inet6 addr: fe80::213:20ff:feb7:1d44/64 Scope:Link

UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1



RX packets:48153 errors:4 dropped:0 overruns:0 frame:4  
TX packets:21992 errors:0 dropped:0 overruns:0 carrier:0  
collisions:0 txqueuelen:1000  
RX bytes:39512670 (37.6 MiB) TX bytes:1720318 (1.6 MiB)

5. To check gateway or router ip

```
[root@client ~]# route -nv
```

**Verification:**

Kernel IP routing table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
0.0.0.0	192.168.0.254	0.0.0.0	UG	1024	0	0	enp1s7
192.168.0.0	0.0.0.0	255.255.255.0	U	0	0	0	enp1s7

6. To check DNS IP

```
[root@client ~]# cat /etc/resolv.conf
```

**Verification:**

```
# Generated by NetworkManager
search zoomgroup.com
nameserver 192.168.0.253
```



## LAB 24 : FTP SERVER

### OBJECTIVE:

To configure FTP server to act as a central repository of files which can be accessed by legitimate clients.

To download and upload files to an FTP server.

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



**System1**

**FTP Server**

**IP Address 192.168.0.X**

**System2**

**FTP Client**

**IP Address 192.168.0.X**

## FTP Server Configuration for downloading files

1. Check whether the FTP package exists,  
and install the application

```
[root@ftpserver ~]# rpm -q vsftpd
```

**Verification:**

```
vsftpd-3.0.2-9.el7.x86_64
```

*If it exists ,remove the package*

```
[root@ftpserver ~]# rpm -e vsftpd
```

*Do a fresh install of the FTP package*

```
[root@ftpserver ~]# yum install vsftpd* -y
```

**Verification:**

```
Running transaction
```

```
Warning: RPMDB altered outside of yum.
```

```
Installing : vsftpd-3.0.2-9.el7.x86_64                1/1
```

```
Verifying : vsftpd-3.0.2-9.el7.x86_64                1/1
```

```
Installed:
```

```
vsftpd.x86_64 0:3.0.2-9.el7
```

2. Add some files to the ftp default directory

```
[root@ftpserver ~]# cd /var/ftp/pub
```

```
[root@ftpserver pub]# touch zoom.txt linux.txt music.mp3
```

**Verification:**

```
[root@ftpserver pub]# ls
```

```
linux.txt music.mp3 zoom.txt
```

3. Start the service

```
[root@ftpserver ~]# service vsftpd restart
```

```
Redirecting to /bin/systemctl restart vsftpd.service
```

```
##### OR #####
```



```
[root@ftpserver ~]# systemctl enable vsftpd
```

## FTP Client Configuration for downloading files

1. Connect to ftp server to download files

```
[root@ftpclient ~]# ftp 192.168.0.X
```

```
Name (192.168.0.X:root): ftp
```

```
331 Please specify the password.
```

```
Password: enter key
```

```
230 Login successful.
```

```
ftp> ls
```

```
drwxr-xr-x  3 0      0      4096 aug 19 20:44 pub
```

```
ftp> cd pub
```

```
ftp> ls
```

```
-rw-r--r--  1 0      0      0 Jul 11 20:42 zoom.txt
```

```
-rw-r--r--  1 0      0      0 Jul 11 20:42 linux.txt
```

```
-rw-r--r--  1 0      0      0 Jul 11 20:42 music.mp3
```

```
ftp>mget zoom.txt* linux.txt*
```

```
ftp>bye
```

2. To check downloaded files, move to client home directory

```
[root @ftpclient ~]# ls /root
```

### Result:

```
Anaconda.cfg install.log install.log.syslog Desktop zoom.txt linux.txt
```



## FTP Server Configuration for uploading files

1. Add new directory in ftp default directory

```
[root@ftpserver ~]# mkdir /var/ftp/upload
```

2. Give full permissions on new dir

```
[root@ftpserver ~]# chmod 777 /var/ftp/upload
```

### Verification:

```
[root@ftpserver ~]# ls -ld /var/ftp/upload
```

```
drwxr-xr-x 2 root root 4096 Aug 31 08:30 /var/ftp/upload
```

3. Edit the ftp directory as follows...

```
[root@ftpserver ~]# vi /etc/vsftpd/vsftpd.conf
```

```
12      anonymous_enable=YES
16      local_enable=YES
29      anon_upload_enable=YES
37      dirmessage_enable=YES
86      ftpd_banner=Welcome to Zoom Linux.
```

```
:wq!
```

4. Restart the ftp service

```
[root@ftpserver ~]# service vsftpd restart
```

#### OR ####

```
[root@ftpserver ~]# systemctl enable vsftpd
```





## FTP Client Configuration for uploading files

### 1. Connect ftp server from client system

```
[root@ftpcient ~]# ftp 192.168.0.X
```

```
Name (192.168.0.X:root): ftp
```

```
331 Please specify the password.
```

```
Password: enter key
```

```
230 Login successful.
```

```
ftp>ls
```

```
drwxr-xr-x  3 0      0      4096 aug 19 20:44 pub
```

```
drwxrwxrwx  2 0      0      4096 aug 19 21:05 zoomupload
```

```
ftp>pwd
```

```
ftp>cd ..
```

```
ftp>cd zoomupload
```

```
ftp>pwd (to check present working directory)
```

```
ftp>mput initial-setup-ks.cfg
```

```
ftp>bye
```

**Note:** To check client uploaded files, move to ftp server and check in ftp

#### Verification:

```
[root@ftpserver ~]# ls /var/ftp/zoomupload
```

#### Verification:

```
initial-setup-ks.cfg
```



## LAB 25: YUM SERVER

**OBJECTIVE:**

To configure YUM Deployment Server and client

**PRE-REQUISITE:**

Two Machines with Linux Installed.

**TOPOLOGY:**

**System1**

**YUM Server**

**IP Address 192.168.0.X**

**System2**

**YUM Client**

**IP Address 192.168.0.X**

## YUM Server Configuration

1. Install ftp application by using the Linux OS dvd

```
[root@YumServer ~]# mount /dev/sr0 /media
```

```
[root@YumServer ~]# cd /media/Packages
```

### Verification:

```
[root@YumServer ~]# ls
```

```
389-ds-base-libs-1.3.1.6-25.el7.x86_64.rpm
a2ps-4.14-23.el7.i686.rpm
a2ps-4.14-23.el7.x86_64.rpm
abattis-cantarell-fonts-0.0.12-3.el7.noarch.rpm
abrt-2.1.11-12.el7.centos.x86_64.rpm
```

```
[root@YumServer ~]# rpm -ivh vsftpd* --force
```

### Result:

```
Preparing... ##### [100%]
Updating / installing...
1:vsftpd-3.0.2-9.el7 ##### [ 50%]
2:vsftpd-sysvinit-3.0.2-9.el7 ##### [100%]
```

2. Copy DVD's complete data into ftp dir

```
[root@YumServer ~]# cp -rv /media/* /var/ftp/pub
```

### Result:

```
'/media/CentOS_BuildTag' -> '/var/ftp/pub/CentOS_BuildTag'
'/media/EFI' -> '/var/ftp/pub/EFI'
'/media/EFI/BOOT' -> '/var/ftp/pub/EFI/BOOT'
'/media/EFI/BOOT/BOOTX64.efi' -> '/var/ftp/pub/EFI/BOOT/BOOTX64.efi'
'/media/EFI/BOOT/fonts' -> '/var/ftp/pub/EFI/BOOT/fonts'
'/media/EFI/BOOT/fonts/TRANS.TBL' -> '/var/ftp/pub/EFI/BOOT/fonts/TRANS.TBL'
'/media/EFI/BOOT/fonts/unicode.pf2' -> '/var/ftp/pub/EFI/BOOT/fonts/unicode.pf2'
```



3. Create a repository at side where all rpms are copied

```
[root@YumServer ~]# cd /var/ftp/pub/Packages
```

```
[root@YumServer ~]# rpm -ivh createrepo* deltarpm* --force --nodeps
```

4. Remove the old repodata directory from where all rpms copied

```
[root@YumServer ~]# cd /var/ftp/pub
```

```
[root@YumServer ~]# rm -rf repodata
```

5. Create a new repodata (Repositories)

```
[root@YumServer ~]# createrepo -g <dvd_mount_point>/<repodata_dir>/<file>
```

```
[root@YumServer ~]# createrepo -g /media/Packages/repodata/repomd.xml
```

```
/var/ftp/pub/Packages
```

6. Start FTP Service

```
[root@YumServer ~]# service vsftpd restart
```

```
##### OR #####
```

```
[root@YumServer ~]# systemctl enable vsftpd
```

7. Edit the yum configuration file, by providing the path of repository and IP-address

```
[root@YumClient ~]# vi /etc/yum.repos.d/CentOS-Base.repo
```

**Verification:**

```
[core]
```

```
name= Linux $releasever - $basearch - Debug
```

```
baseurl=ftp://192.168.0.250/pub/Packages
```

```
enabled=1
```

```
gpgcheck=1
```

```
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
```

```
:wq!
```



## YUM Client Configuration

1. Edit the yum configuration file, by providing the path of repository and server ip-address

```
[root@YumClient ~]# vi /etc/yum.repos.d/CentOS-Base.repo
```

```
[core]
name= Linux $releasever - $basearch - Debug
baseurl=ftp://192.168.0.250/pub/Packages
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
:wq!
```

### Verification:

```
[root@YumServer ~]# yum install firefox* -y
```

```
Loaded plugins: fastestmirror, langpacks
base | 3.6 kB 00:00:00
Loading mirror speeds from cached hostfile
Resolving Dependencies
--> Running transaction check
---> Package firefox.x86_64 0:24.5.0-1.el7.centos will be installed
--> Finished Dependency Resolution

Installing : firefox-24.5.0-1.el7.centos.x86_64 1/1
Verifying : firefox-24.5.0-1.el7.centos.x86_64 1/1

Installed:
firefox.x86_64 0:24.5.0-1.el7.centos
```

```
Complete!
```



## LAB 26: NFS SERVER

### OBJECTIVE:

To share Network resources with an NFS server

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



**System1**

**NFS Server**

**IP Address 192.168.0.X**

**System2**

**NFS Client**

**IP Address 192.168.0.X**



## NFS Server Configuration

### 1. Install NFS application

```
[root@nfsserver ~]# yum install nfs* -y
```

```
[root@nfsserver ~]# rpm -qa nfs*
```

#### Verification:

```
nfs-utils-1.3.0-0.el7.x86_64
```

```
nfsometer-1.7-0.el7.noarch
```

```
nfs4-acl-tools-0.3.3-13.el7.x86_64
```

```
nfstest-1.0.2-2.el7.noarch
```

### 2. Add a directory to share

```
[root@nfsserver ~]# mkdir /zoomshare
```

```
[root@nfsserver ~]# cat > /zoomshare/"Advanced Linux"
```

The zoomshare directory contains the names of Advanced Linux course topics  
CLUSTERS, SAN, LDAP, SAMBA, NAGIOS, PROXY and TROUBLESHOOTING etc.

**Ctrl+d (to save file data)**

### 3. List the share directory data

```
[root@nfsserver ~]# ls /zoomshare
```

### 4. Give full permissions on share directory

```
[root@nfsserver ~]# chmod 777 /zoomshare
```

#### Verification:

```
[root@nfsserver ~]# ls -ld /zoomshare
```

```
drwxrwxrwx 2 root root 4096 Aug 31 12:57 /zoomshare
```



5. Provide share directory name in NFS configuration file and give share permissions.

```
[root@nfsserver ~]# vi /etc/exports
```

```
/zoomshare      192.168.0.0/255.255.255.0(rw,sync)
```

```
:wq!
```

6. Start the nfs service

```
[root@nfsserver ~]# service nfs restart
```

```
#### OR #####
```

```
[root@nfsserver ~]# systemctl enable nfs
```

7. Verify the list of exported directories where 192.168.0.X is the NFS server IP Address

```
[root@nfsserver ~]# showmount -e 192.168.0.X
```

**Result:**

Export list for 192.168.0.X :

```
/zoomshare 192.168.0.0/255.255.255.0
```

## NFS Client Configuration

1. Verify the exported directory of server

```
[root@nfsclient ~]# showmount -e 192.168.0.X
```

**Result:**

Export list for 192.168.0.X :

```
/zoomshare 192.168.0.0/255.255.255.0
```

2. Mount the shared directory

```
[root@nfsclient ~]# mount 192.168.0.X:/zoomshare /mnt
```

3. Find the mount point of nfs server

```
[root@nfsclient ~]# mount
```



**Verification:**

```
/dev/sda5 on / type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda2 on /usr type ext4 (rw,relatime,seclabel,data=ordered)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs
192.168.0.250:/var/ftp/pub/centos7 on /mnt type nfs (rw,relatime,seclabel,data=ordered)
/dev/sda1 on /boot type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda6 on /home type ext4 (rw,relatime,seclabel,data=ordered)
/dev/sda3 on /var type ext4 (rw,relatime,seclabel,data=ordered)
```

**4. Check the server data**

```
[root@nfsclient ~]# cd /mnt/zoomshare
```

```
[root@nfsclient zoomshare]# cat "Advanced Linux"
```

**Verification: NFS share directory data can be shown**

The zoomshare directory contains the names of Advanced Linux course topics  
CLUSTERS, SAN, LDAP, SAMBA, NAGIOS, PROXY and TROUBLESHOOTING etc.



## LAB 27: DNS SERVER

### OBJECTIVE:

To provide name resolution in a network with a DNS server

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



#### System1

DNS Server

IP Address 192.168.0.X

#### System2

DNS Linux Client

IP Address 192.162.0.X

## DNS Server Configuration

1. Check and assign IP address to the DNS server according to your setup

```
[root@dns ~]# nmtui
```

```
Profile name enp1s7
```

```
Addresses 192.168.0.1/24
```

```
DNS servers 192.168.0.X
```

```
[root@dns ~]# service network restart
```

```
[root@dns ~]# ifconfig
```

### Verification:

```
Enp1s7: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
  inet 192.168.0.1 netmask 255.255.255.0 broadcast 192.168.0.255
  inet6 fe80::20c:29ff:fe6a:f2a6 prefixlen 64 scopeid 0x20<link>
  ether 00:0c:29:6a:f2:a6 txqueuelen 1000 (Ethernet)
  RX packets 379 bytes 44431 (43.3 KiB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 296 bytes 50119 (48.9 KiB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

2. Change Hostname of computer

```
[root@dns ~]# hostname dns.zoomgroup.com
```

3. Map Hostname and IP for local resolution

```
[root@dns ~]# vi /etc/hosts
```

```
127.0.0.1 localhost.localdomain localhost
```

```
192.168.0.1 dns.zoomgroup.com dns
```

```
:wq!
```

4. Change Hostname permanent

```
[root@dns ~]# vi /etc/hostname
```

```
dns.zoomgroup.com
```

5. **NOW LOG OFF and LOG IN to make the changes permanent in the kernel**

6. **Check the dns applications**

```
[root@dns ~]# rpm -qa bind*
```

**Verification:**

```
bind-libs-lite-9.9.4-14.el7.x86_64
bind-chroot-9.9.4-14.el7.x86_64
bind-utils-9.9.4-14.el7.x86_64
bind-dyndb-ldap-3.5-4.el7.x86_64
bind-libs-9.9.4-14.el7.x86_64
bind-9.9.4-14.el7.x86_64
bind-license-9.9.4-14.el7.noarch
```

7. **Remove the dns applications**

```
[root@dns ~]# yum remove bind* -y
```

8. **Install the dns applications**

```
[root@dns ~]# yum install bind* -y
```

9. **Edit DNS file and provide the IP address it listens on**

```
[root@dns ~]# vi /etc/named.conf
```

```
11: listen-on port 53 { 127.0.0.1; 192.168.0.1; };
```

```
17: allow-query { localhost; 192.168.0.0/24; };
```

```
:wq!
```





#### 10. Edit DNS file by providing zone file names

```
[root@dns ~]# vi /etc/named.rfc1912.zones
```

```
zone "zoomgroup.com" IN {  
    type master;  
    file "zoom.for";  
    allow-update { none; };  
};  
zone "0.168.192.in-addr.arpa" IN {  
    type master;  
    file "zoom.rev";  
    allow-update { none; };  
};  
  
:wq!
```

#### 11. Create Forward Zone and Reverse Zone files

```
[root@dns ~]# cd /var/named
```

##### Verification:

```
[root@dns named]# ls
```

```
chroot data dynamic named.ca named.empty named.localhost named.loopback slaves
```

```
[root@dns named]# cp -p named.localhost zoom.for
```

```
[root@dns named]# cp -p named.loopback zoom.rev
```

##### Verification:

```
[root@dns named]# ll
```

```
total 40  
drwxr-x--- 7 root named 4096 Sep  1 06:54 chroot  
drwxrwx--- 2 named named 4096 Sep  1 07:04 data  
drwxrwx--- 2 named named 4096 Sep  1 07:04 dynamic  
-rw-r----- 1 root named 2076 Jan 28  2013 named.ca  
-rw-r----- 1 root named  152 Dec 15  2009 named.empty  
-rw-r----- 1 root named  152 Jun 21  2007 named.localhost  
-rw-r----- 1 root named  168 Dec 15  2009 named.loopback
```



```
drwxrwx--- 2 named named 4096 Jun 10 2014 slaves
-rw-r----- 1 root named 152 Jun 21 2007 zoom.for
-rw-r----- 1 root named 168 Dec 15 2009 zoom.rev
```

## 12. Edit Forward zone file

```
[root@dns named]# vi zoom.for
```

```
$TTL 86400
```

```
@      IN SOA  dns.zoomgroup.com.  root.zoomgroup.com. (
                                42      ; serial (d. adams)
                                3H      ; refresh
                                15M     ; retry
                                1W      ; expiry
                                1D )    ; minimum
```

```
IN NS      dns.zoomgroup.com.
dns        IN A      192.168.0.1
nfs        IN A      192.168.0.10
ftp        IN A      192.168.0.11
smb        IN A      192.168.0.12
mail       IN A      192.168.0.13
zoomgroup.com. IN MX 5 mail
web        IN A      192.168.0.14
www        IN CNAME   web
```

```
:wq!
```

## 13. Edit reverse zone file

```
[root@dns named]# vi zoom.rev
```

```
$TTL 86400
```

```
@      IN      SOA      dns.zoomgroup.com. root.zoomgroup.com. (
                                1997022700 ; Serial
                                28800      ; Refresh
                                14400      ; Retry
                                3600000    ; Expire
                                86400 )    ; Minimum
```

```
IN      NS      dns.zoomgroup.com.
IN      NS      slavedns.zoomgroup.com.
```



```
1  IN  PTR  dns.zoomgroup.com.
10 IN  PTR  nfs.zoom.com.
11 IN  PTR  ftp.zoom.com.
12 IN  PTR  smb.zoom.com.
13 IN  PTR  mail.zoomgroup.com.
14 IN  PTR  web.zoom.com.
```

**:wq!**

#### 14. To Check the Syntax errors of Configuration file

##### Syntax:

```
[root@localhost ~]# named-checkconf <path_of_configuration_file>
```

```
[root@localhost ~]# named-checkconf /etc/named.conf
```

```
[root@localhost ~]# named-checkconf/etc/named.rfc1912.zones
```

##### Verification:

If no errors then no output will be displayed.

#### 15. To Check the Zone file syntax errors

##### Syntax:

```
[root@localhost ~]# named-checkconf <Domain_name> <path_of_zone_files>
```

```
[root@localhost ~]# named-checkzone zoomgroup.com /var/named/zoom.for
```

```
[root@localhost ~]# named-checkzone zoomgroup.com /var/named/zoom.rev
```

#### 16. Provide the IP address of the DNS Server

```
[root@dns named]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.1
```

**:wq!**



## 17. Start the DNS service

```
[root@dns named]# service named restart
```

Redirecting to /bin/systemctl restart named.service

##### OR #####

```
[root@dns named]# systemctl enable named
```

## DNS Client Configuration

### 1. Provide the DNS server ip in resolv.conf file

```
[root@dns named]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.1
```

```
:wq!
```

### 2. Check the forward lookup zone Resolution Answer by using dig command

#### Syntax::

```
[root@dns named]# dig <Fully_qualified_domain_name>
```

```
[root@dns named]# dig dns.zoomgroup.com
```

#### Result:

```
; <<>> DiG 9.9.4-RedHat-9.9.4-14.el7 <<>> dns.zoomgroup.com
;; global options: +cmd
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 21811
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags;; udp: 4096
;; QUESTION SECTION:
;dns.zoomgroup.com.      IN      A

;; ANSWER SECTION:
dns.zoomgroup.com.      86400  IN      A      192.168.0.1

;; AUTHORITY SECTION:
zoomgroup.com.          86400  IN      NS      dns.zoomgroup.com.
```



```
;; Query time: 1 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Tue Sep 01 07:32:23 IST 2015
;; MSG SIZE rcvd: 76
```

### 3. Check the reverse lookup zone Resolution Answer by using dig command

#### Verification:

```
[root@dns named]# dig -x <self_system_ip>
```

```
[root@dns named]# dig -x 192.168.0.1
```

#### Result:

```
; <<>> DiG 9.9.4-RedHat-9.9.4-14.el7 <<>> -x 192.168.0.1
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53498
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 2

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags;; udp: 4096
;; QUESTION SECTION:
;1.0.168.192.in-addr.arpa. IN PTR

;; ANSWER SECTION:
1.0.168.192.in-addr.arpa. 86400 IN PTR dns.zoomgroup.com.

;; AUTHORITY SECTION:
0.168.192.in-addr.arpa. 86400 IN NS 0.168.192.in-addr.arpa.

;; ADDITIONAL SECTION:
0.168.192.in-addr.arpa. 86400 IN A 192.168.0.1

;; Query time: 0 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Tue Sep 01 07:36:13 IST 2015
;; MSG SIZE rcvd: 114
```



#### 4 . Check the Resolution Answer by using ping command

##### Verification:

```
[root@server ~]# ping dns.zoomgroup.com
```

```
PING dns.zoomgroup.com (192.168.0.110) 56(84) bytes of data.
```

```
64 bytes from server.zoomgroup.com (192.168.0.1): icmp_seq=1 ttl=64
```

```
64 bytes from server.zoomgroup.com (192.168.0.1): icmp_seq=2 ttl=64
```

```
64 bytes from server.zoomgroup.com (192.168.0.1): icmp_seq=3 ttl=64
```





## LAB 28: POSTFIX MAIL SERVER

### OBJECTIVE:

To configure Postfix mail server to send and receive mails

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



## Mail Server Configuration

1. Check the ip-address on the server chosen as mail server

```
[root@client ~]# ifconfig
```

2. Assign the IP address for mail server

```
[root@client ~]# nmtui
```

Profile name enp1s7

Addresses 192.168.0.20/24

DNS servers 192.168.0.1

```
[root@client ~]# service network restart
```

3. Change Hostname permanently

```
[root@client ~]# hostname mail.zoomgroup.com
```

```
[root@client ~]# vi /etc/hostname
```

```
mail.zoomgroup.com
```

```
:wq!
```

4. Map Hostname and IP for local resolution

```
[root@client ~]# vi /etc/hosts
```

```
127.0.0.1 localhost.localdomain localhost
```

```
192.168.0.20 mail.zoomgroup.com mail
```

```
:wq!
```

### Verification:

```
[root@client ~]# hostname
```

```
mail.zoomgroup.com
```

5. NOW LOG OFF and LOG IN to make the changes permanent in the kernel



6. Check whether postfix is already installed

```
[root@mail ~]# rpm -qa postfix*
```

Verification:

```
postfix-2.10.1-6.el7.x86_64
```

*remove postfix if it's already installed*

```
[root@mail ~]# yum remove postfix* -y
```

7. Do a fresh install of postfix

```
[root@mail ~]# yum install postfix* -y
```

8. Edit postfix configuration file by providing domain name

```
[root@mail ~]# vi /etc/postfix/main.cf
```

```
75. myhostname = mail.zoomgroup.com
```

```
83. mydomain = zoomgroup.com
```

```
:wq!
```

9. Start the service

```
[root@mail ~]# service postfix restart
```

```
##### OR #####
```

```
[root@mail ~]# systemctl restart postfix
```

10. Create users, assign passwords and test the mail at command prompt by using mail client utility.

```
[root@mail ~]# useradd tom
```

```
[root@mail ~]# useradd john
```

```
[root@mail ~]# passwd tom
```

```
[root@mail ~]# passwd john
```



**11. Switch to a user tom and compose a mail to john**

```
[root@mail ~]# su - tom
```

Verification: tom composing mail to john in cli mode

```
[tom@mail ~]$ mail john@mail.zoomgroup.com
```

Subject: test mail from tom

he hello

test mail from tom

mail test 1

**Note:** New row first column type dot (.) To end the message

Cc: [tom@mail.zoomgroup.com](mailto:tom@mail.zoomgroup.com)

```
[tom@mail ~]$
```

```
[tom@mail ~]$ exit
```

**12. Switch to user john and check the mails**

```
[root@mail ~]# su - john
```

```
[john@mail ~]$
```

**13. Type mail and see the output as below**

```
[john@mail ~]$ mail
```

**Result:**

Mail version 8.1 6/6/93. Type ? for help.

"/var/spool/mail/john": 1 message 1 new

>N 1 tom@mail.zoomgroup.com Sat Jul 12 04:54 19/601 "test mail from tom"  
and 1

Message 1:

From tom@mail.zoomgroup.com Sat Jul 12 04:54:18 2013

Date: Sat, 12 Jul 2013 04:51:38 -0400

From: [tom@mail.zoomgroup.com](mailto:tom@mail.zoomgroup.com)

To: [john@mail.zoomgroup.com](mailto:john@mail.zoomgroup.com)

Subject: test mail from tom

Cc: [tom@mail.zoomgroup.com](mailto:tom@mail.zoomgroup.com)



he hello

test mail from tom

mail test 1

and x

You have mail in /var/spool/mail/john

[john@mail ~]\$ exit

## Configuration of Squirrel Mail to compose the mail on GUI mode

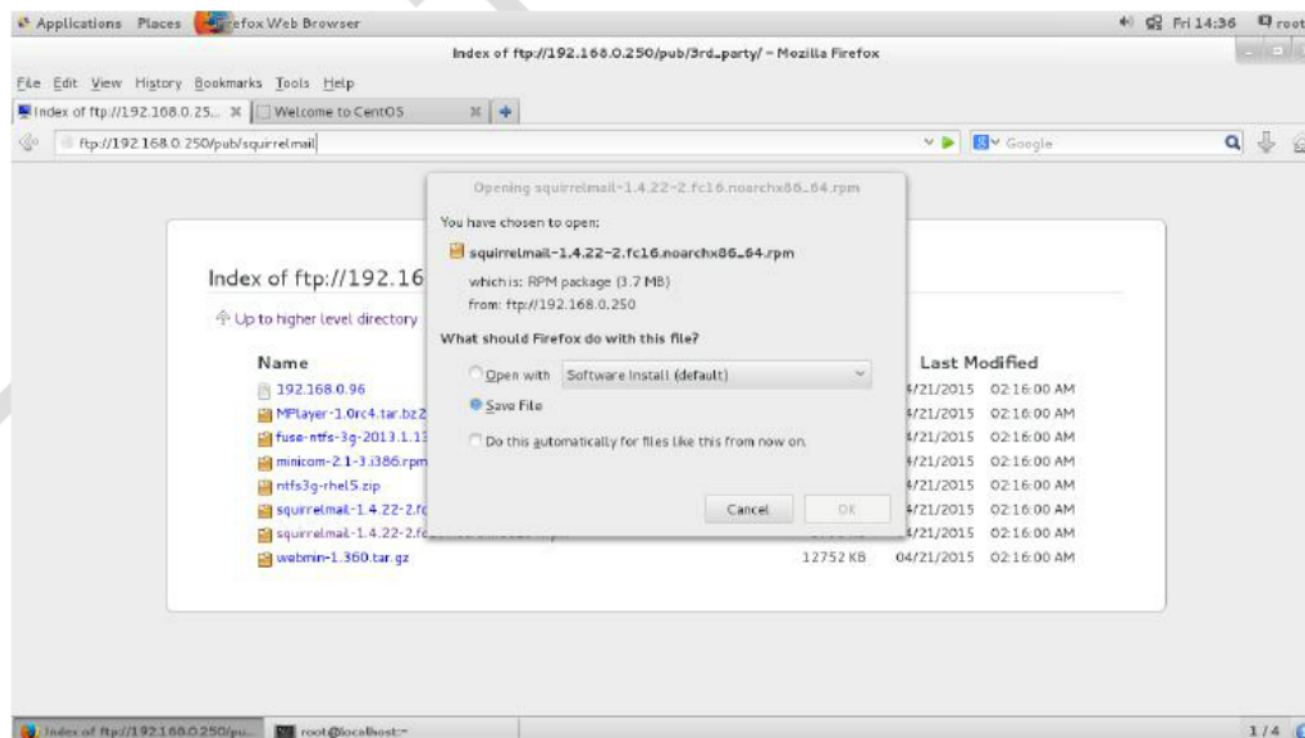
1. Check and install the following packages

```
[root@mail ~]# yum install httpd* perl-5* php* curl* dovecot* mod_ssl* hunspell-en*  
tmpwatch* -y
```

2. Check and download squirrelmail package from Lab server

```
[root@mail ~]# firefox ftp://192.168.0.250/pub
```

### Verification:



**Note:** After downloading `squirrelmail-1.4.22-2.fc16.noarch.rpm` and `php-mbstring-5.4.16-21.el7.x86_64.rpm` packages install with `rpm`.

```
[root@mail ~]# cd /root/Downloads
```

```
[root@mail ~]# ls
```

```
[root@mail ~]# rpm -ivh php-mbstring-5.4.16-21.el7.x86_64.rpm php-mbstring-5.4.16-21.el7.x86_64.rpm
```

### 3. Edit first dovecot configuration file

```
[root@mail ~]# vi /etc/dovecot/conf.d/10-auth.conf
```

```
10: disable_plaintext_auth = no (before from line remove # and change from 'yes' into 'no')
```

```
100: auth_mechanisms = plain login(before from line remove # and at last add login)
```

### 4. Edit dovecot second configuration file

```
[root@mail ~]# vi /etc/dovecot/conf.d/10-mail.conf
```

```
25: mail_location = mbox: ~/mail: INBOX=/var/spool/mail/%u (before from line remove # and complete the directory by adding spool)
```

```
119: mail_access_group = mail(remove # from beginning of line and mail at last)
```

### 5. Copy squirrelmail directory data into apache default directory

```
[root@mail ~]# cp -rv /usr/share/squirrelmail/* /var/www/html
```

### 6. Start the services

```
[root@mail ~]# service postfix restart
```

Restarting postfix (via systemctl):

##### OR #####

```
[root@mail ~]# systemctl enable postfix
```





```
[root@mail ~]# service dovecot restart
```

```
Redirecting to /bin/systemctl restart dovecot.service
```

```
##### OR #####
```

```
[root@mail ~]# systemctl enable dovecot
```

```
[root@mail ~]# service httpd restart
```

```
Redirecting to /bin/systemctl restart httpd.service
```

```
##### OR #####
```

```
[root@mail ~]# systemctl enable httpd
```

## Mail Server Client Configuration

1. Provide the DNS server IP-address

```
[root@mailclient ~]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.x
```

2. Append the mailserver information in host file

```
[root@mailclient ~]# vi /etc/hosts
```

```
192.168.0. Client_ip_x mailclient.zoomgroup.com mailclient
```

```
192.168.0.Mail_Server_x mail.zoomgroup.com mail
```

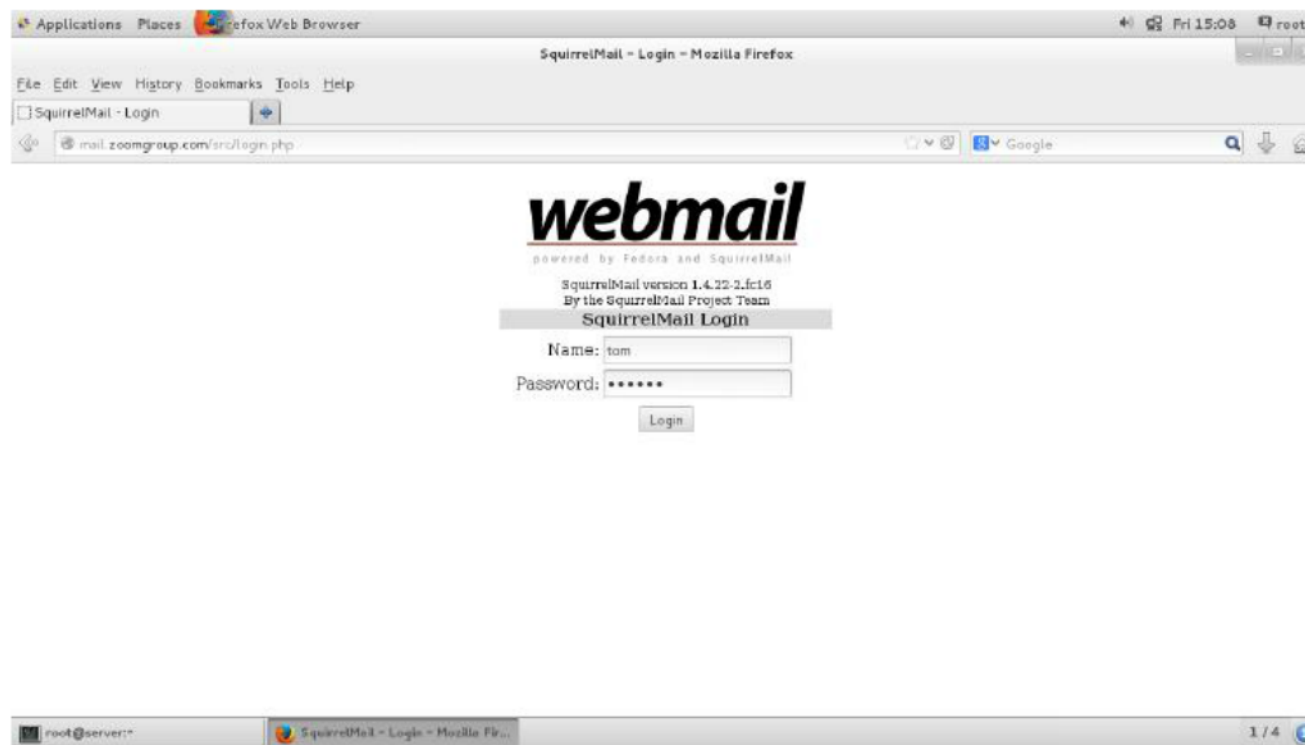
```
:wq!
```



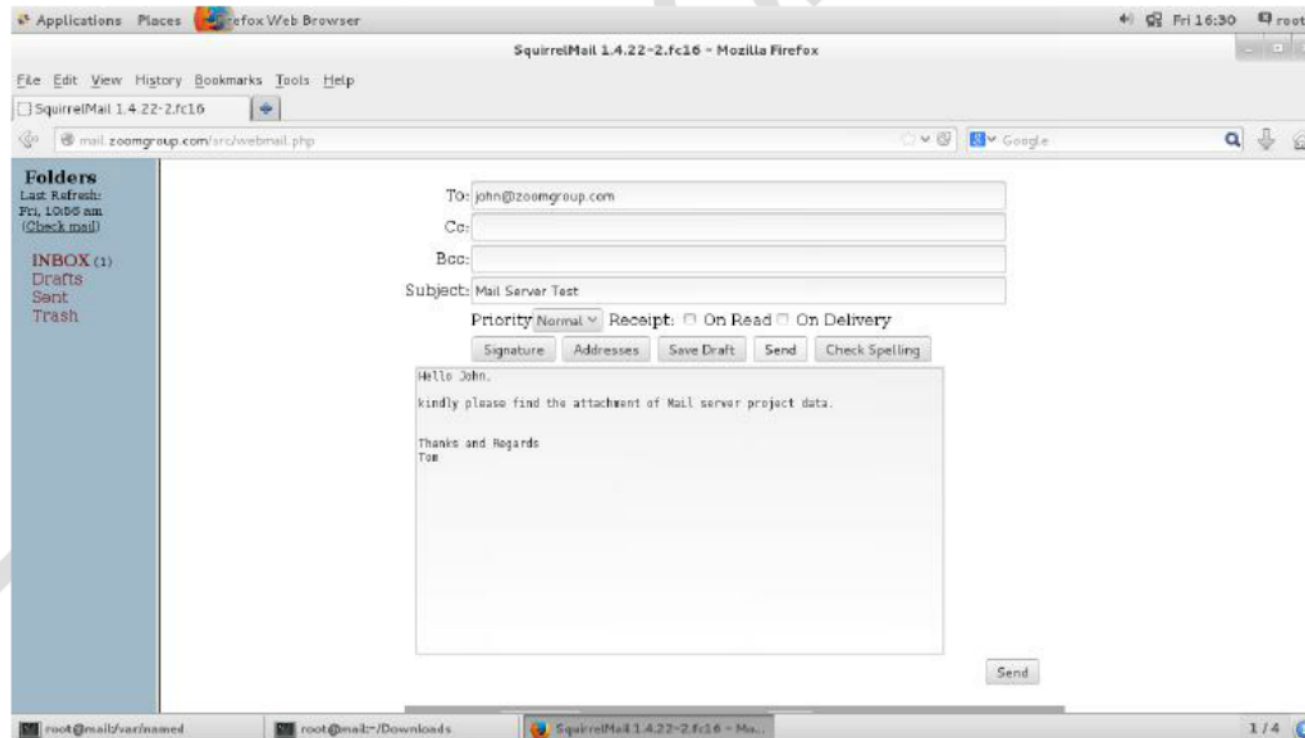
### 3. Compose the mails via web browser

`[root@mailclient ~]# Firefox http://mail.zoomgroup.com`

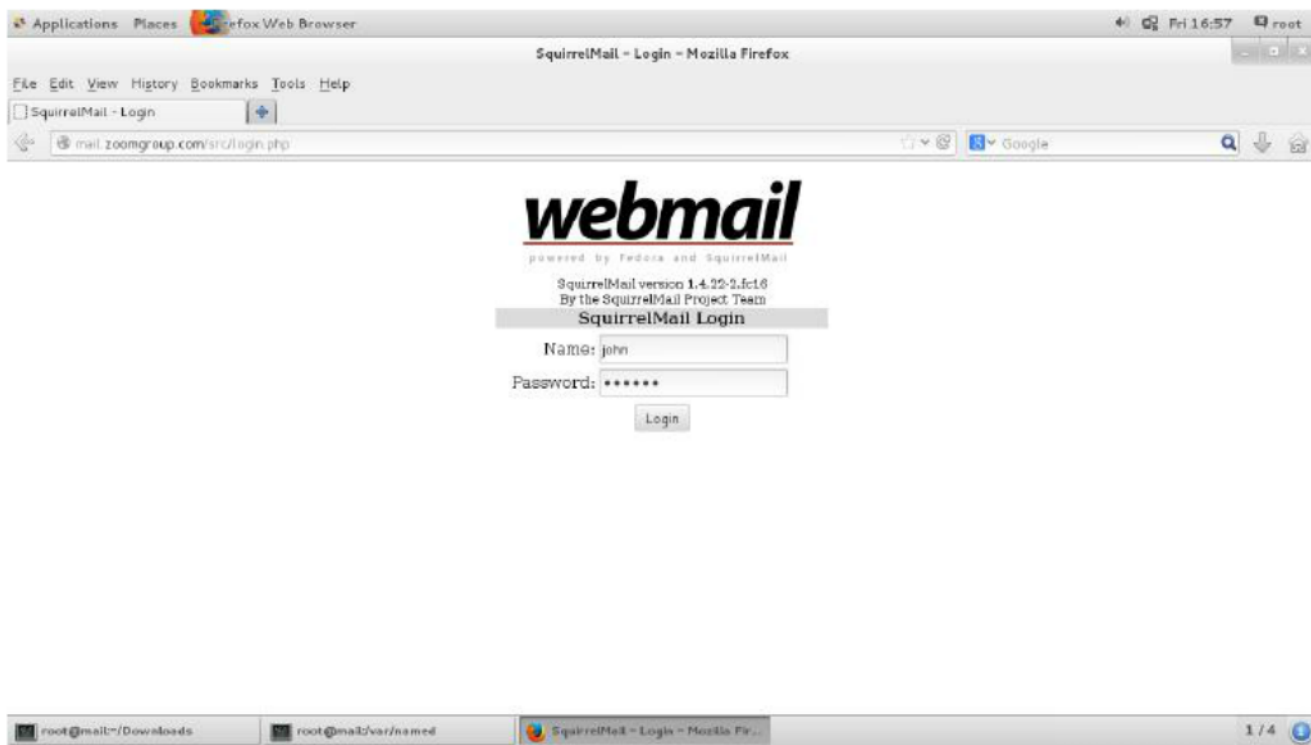
#### Verification: tom login into an account



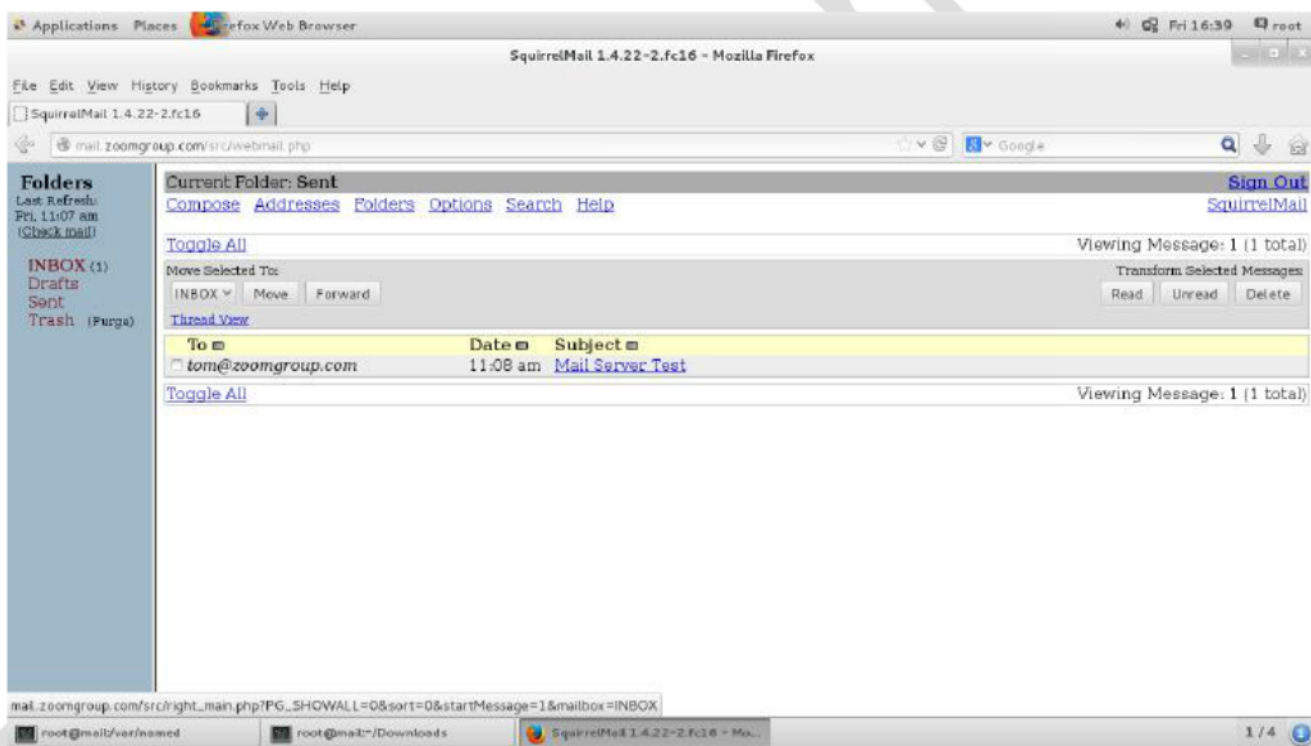
#### Verification: tom composing the mail to john



## Verification: john logs into an account



## Verification: john checking the mail which sent by tom



## LAB 29: APACHE WEB SERVER

### OBJECTIVE:

To Host websites by using APACHE Web Server

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:



## Apache Server Configuration to host websites based on names

### Example:

www.zoomgroup.com

www.google.com

www.yahoo.com

### 1. Assign an ip address to the server

```
[root@web ~]# nmtui
```

```
[root@web ~]# service network restart
```

```
##### OR #####
```

```
[root@web ~]# systemctl enable network
```

```
[root@web ~]# ifconfig
```

### 2. Configure the hosts file

```
[root@web ~]# vi /etc/hosts
```

```
127.0.0.1    localhost.localdomain localhost
```

```
192.168.0.x1 www.zoomgroup.com
```

```
192.168.0.x1 www.google.com
```

```
192.168.0.x1 www.yahoo.com
```

```
:wq!
```

### 3. Edit the httpd configuration File

```
[root@web ~]# vi /etc/httpd/conf/httpd.conf
```

At end of line write the following settings

```
##### NAME BASED #####
```

```
<VirtualHost *:80>
```

```
ServerAdmin root@yahoo.com
```

```
DocumentRoot /var/www/html
```

```
ServerName www.yahoo.com
```

```
DirectoryIndex yahoo.html
```

```
</VirtualHost>
```



```
<VirtualHost *:80>
    ServerAdmin root@google.com
    DocumentRoot /var/www/html
    ServerName www.google.com
    DirectoryIndex google.html
</VirtualHost>
```

```
<VirtualHost *:80>
    ServerAdmin root@zoomgroup.com
    DocumentRoot /var/www/html
    ServerName www.zoomgroup.com
    DirectoryIndex zoomgroup.html
</VirtualHost>
```

**wq: (save and quit)**

#### 4. Create the webpage files with .html extension

```
[root@web ~]# cd /var/www/html
```

```
[root@web ~]# vi yahoo.html
```

```
<html>
<body bgcolor=yellow>
    <marquee><h1> THIS IS YAHOO WEBSITE </h1></marquee>
    <h6> HOSTED IN LINUX SESSION </h6>
</body>
</html>
```

**NOTE:** - Similarly create zoomgroup.html google.html in /var/www/html folder or download original website pages then paste into webserver directory as .html file e.g. yahoo.html from www.yahoo.com website.

#### 5. Start the Web service

```
[root@web ~]# service httpd restart
```

##### OR #####

```
[root@web ~]# systemctl enable httpd
```





## Web Server Client Configuration

1. Provide the IP Address of DNS server if DNS Server is configured on the network

```
[root@webclient ~]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.DNS_IP
```

OR

2. Append the Websites information in host file.

```
[root@webclient ~]# vi /etc/hosts
```

```
192.168.0.x1 www.zoomgroup.com
```

```
192.168.0.x1 www.yahoo.com
```

```
192.168.0.x1 www.google.com
```

```
:wq!
```

3. Open the Browser and access websites

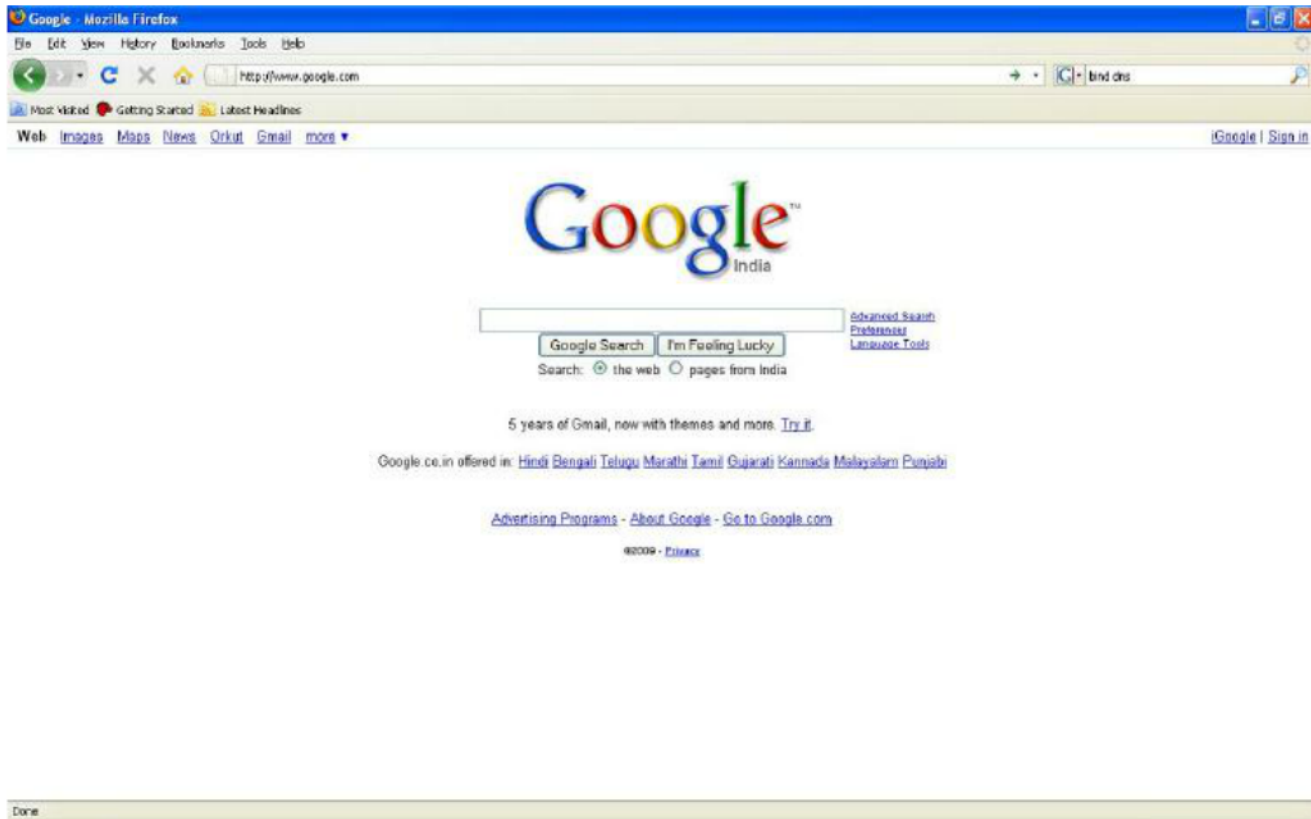
```
[root@webclient ~]# firefox http://www.yahoo.com
```

**Result:**

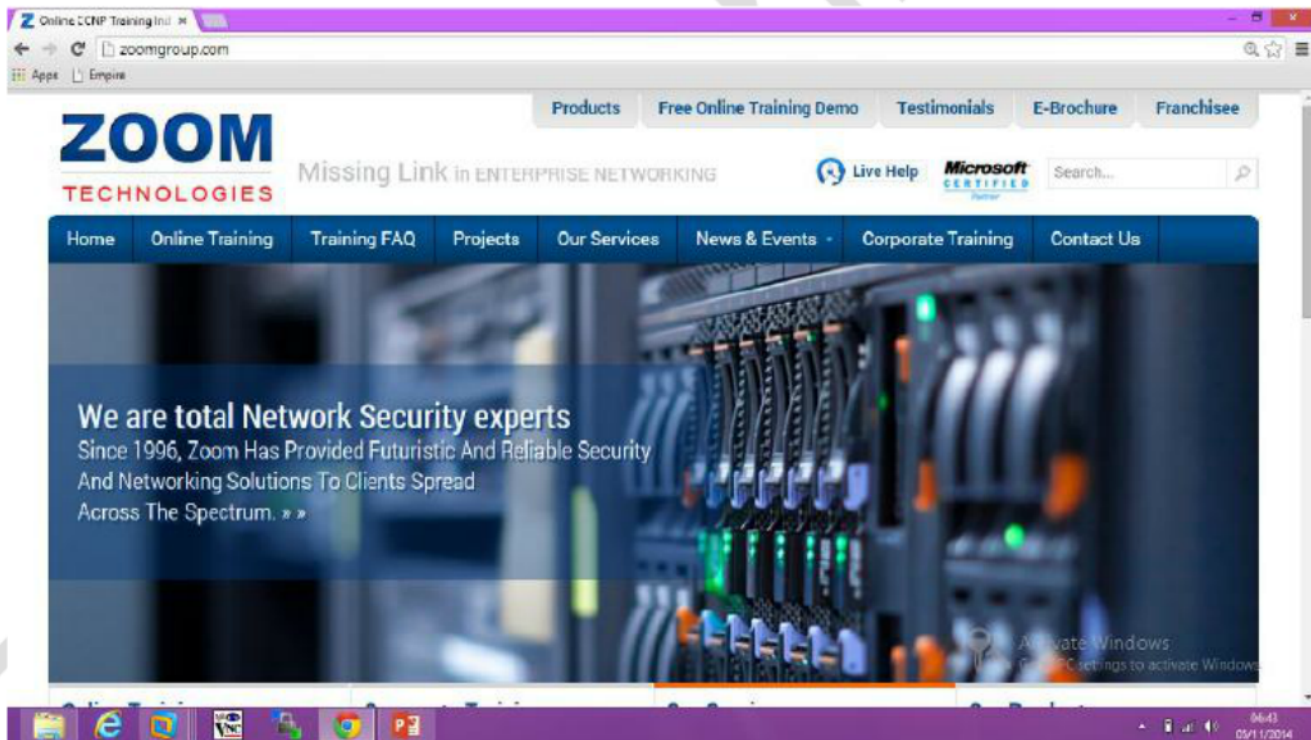


## Verification:

Access [www.google.com](http://www.google.com) via browser



Access [www.zoomgroup.com](http://www.zoomgroup.com) via browser



## Apache Server Configuration to host websites based on IP addresses

### 1. Assigning another Virtual IP on Ethernet interface of the web server for IP Based Hosting

```
[root@web ~]# nmtui
```

Edit a connection => enp1s7 => IPv4 CONFIGURATION

192.168.0.X1/24

ADD =>

192.168.0.X2/24 = OK

```
[root@web ~]# service network restart
```

### 2. To check the ip address

```
[root@web ~]# ip addr show
```

#### Verification:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
```

```
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
```

```
inet 127.0.0.1/8 scope host lo
```

```
valid_lft forever preferred_lft forever
```

```
inet6 ::1/128 scope host
```

```
valid_lft forever preferred_lft forever
```

```
2: enp1s7: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
```

```
link/ether 00:0c:29:6a:f2:a6 brd ff:ff:ff:ff:ff:ff
```

```
inet 192.168.0.X1/24 brd 192.168.0.255 scope global enp1s7
```

```
valid_lft forever preferred_lft forever
```

```
inet 192.168.0.X2/24 brd 192.168.0.255 scope global secondary enp1s7
```

```
valid_lft forever preferred_lft forever
```

```
inet6 fe80::20c:29ff:fe6a:f2a6/64 scope link
```

```
valid_lft forever preferred_lft forever
```

### 3. Makesure the hostfile configuration by providing new ip to website

```
[root@web ~]# vi /etc/hosts
```

```
127.0.0.1    localhost.localdomain localhost
```

```
192.168.0.X1 www.yahoo.com
```

```
192.168.0.X1 www.zoomgroup.com
```

```
192.168.0.X2 www.google.com
```

```
:wq!
```

4. **Edit the webserver file by providing new IP address**

```
[root@web ~]# vi /etc/httpd/conf/httpd.conf
```

```
<VirtualHost 192.168.0.X2:80>  
    ServerAdmin root@google.com  
    DocumentRoot /var/www/html  
    ServerName www.google.com  
    DirectoryIndex google.html  
</VirtualHost>  
:wq
```

5. **Start the service**

```
[root@web ~]# service httpd restart
```

OR

```
[root@web ~]# systemctl restart httpd
```

## Web Server Client Configuration

1. **Open the Browser and type**

```
[root@webclient ~]# Firefox and
```

**Verification:**<http://192.168.0.X2>





## Port based websites configuration

1. **Edit the webserver file by providing port numbers**

```
[root@web ~]# vi /etc/httpd/conf/httpd.conf
```

```
Listen 8000
```

```
<VirtualHost *:8000>
```

```
    ServerAdmin root@zoomgroup.com
```

```
    DocumentRoot /var/www/html
```

```
    ServerName www.zoomgroup.com
```

```
    DirectoryIndex zoomgroup.html
```

```
</VirtualHost>
```

```
:wq
```

2. **Start the service**

```
[root@web ~]# service httpd restart
```

## Web Server Client Configuration

1. **Provide the ip address of DNS server, if DNS Server is configured.**

```
[root@webclient ~]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.DNS_1P
```

2. **Append the websites information in host file.**

```
[root@webclient ~]# vi /etc/hosts
```

```
#### append these names ###
```

```
192.168.0.X1 www.zoomgroup.com
```

```
192.168.0.X1 www.yahoo.com
```

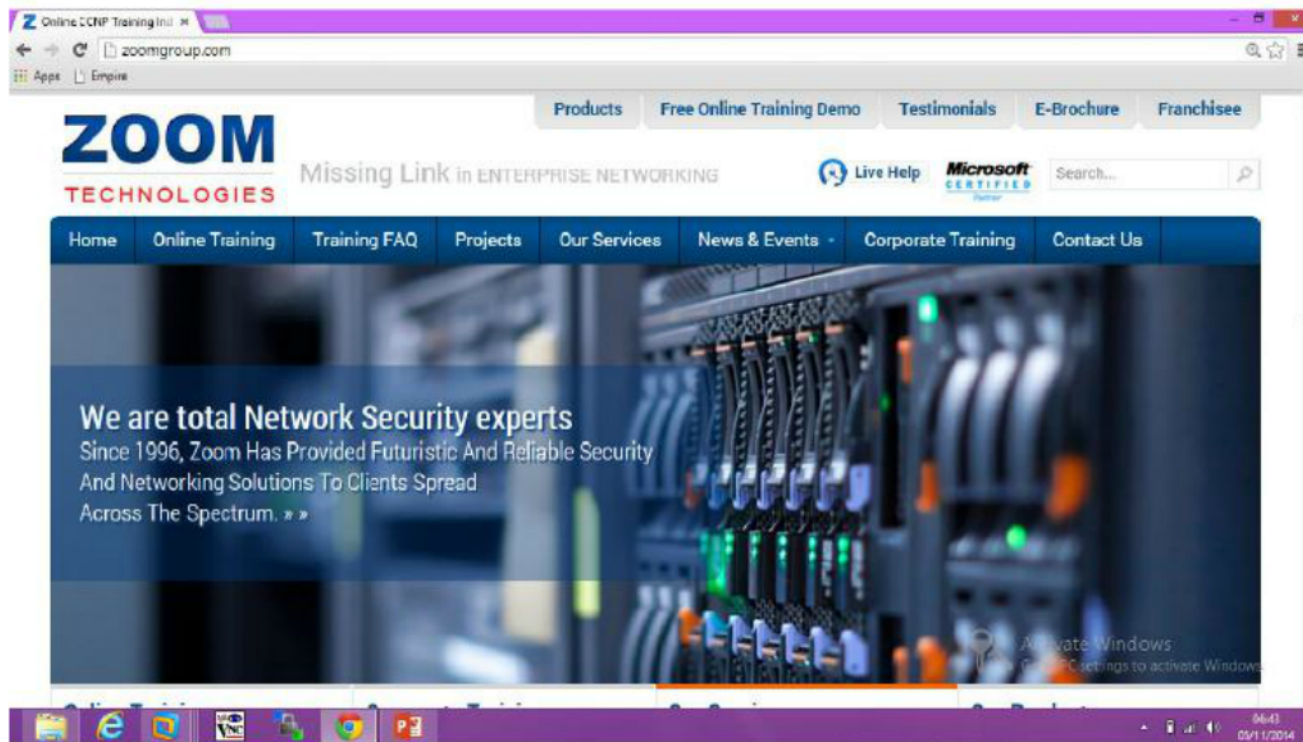
```
192.168.0.X1 www.google.com
```



3. Open the Browser and type

`[root@webclient ~]# firefox and access http://www.zoomgroup.com:8000`

**Verification:**





## LAB 30: AUTHENTICATION ON APACHE WEB SERVER

### OBJECTIVE:

To authenticate clients accessing the website hosted on an Apache Server.

### PRE-REQUISITE:

Two Machines with Linux Installed. Continue from the previous exercise

### TOPOLOGY:



## Web Server Authentication

1. Continue from the previous exercise. Edit the webserver file

```
[root@web ~]# vi /etc/httpd/conf/httpd.conf
```

```
<Directory /var/www/html>
```

```
AuthName "zoom-secure"
```

```
AuthUserFile /mnt/web
```

```
AuthType Basic
```

```
Require Valid-User
```

```
</Directory>
```

```
:wq!
```

2. Create a user and set password for web authentication

```
[root@web ~]# useradd tom
```

```
[root@web ~]# htpasswd -c /mnt/web tom
```

3. Start the service

```
[root@web ~]# service httpd restart
```



## Web Client Authentication

1. Provide the IP address of DNS server if DNS Server is configured on the network

```
[root@webclient ~]# vi /etc/resolv.conf
```

```
nameserver 192.168.0.DNS_1P
```

2. Append the Websites' information in host file.

```
[root@webclient ~]# vi /etc/hosts
```

```
192.168.0.X1 www.zoomgroup.com
```

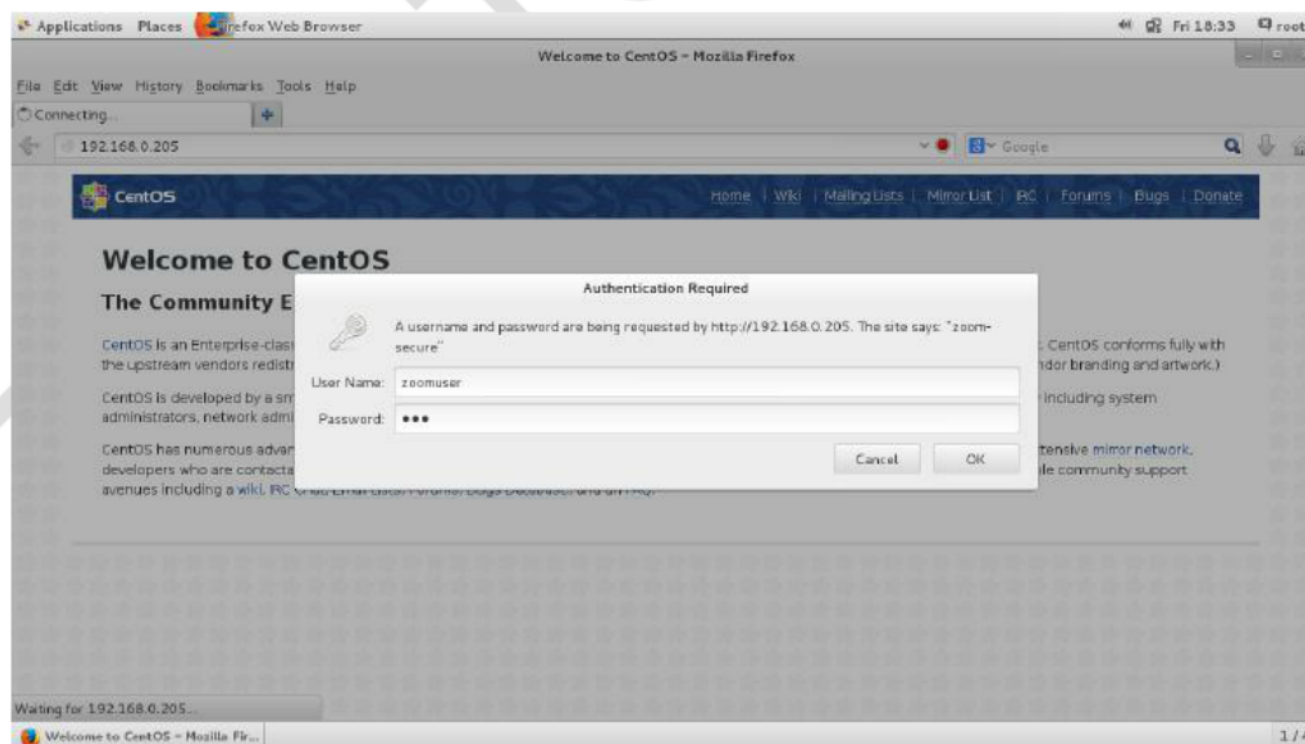
```
192.168.0.X1 www.yahoo.com
```

```
192.168.0.X1 www.google.com
```

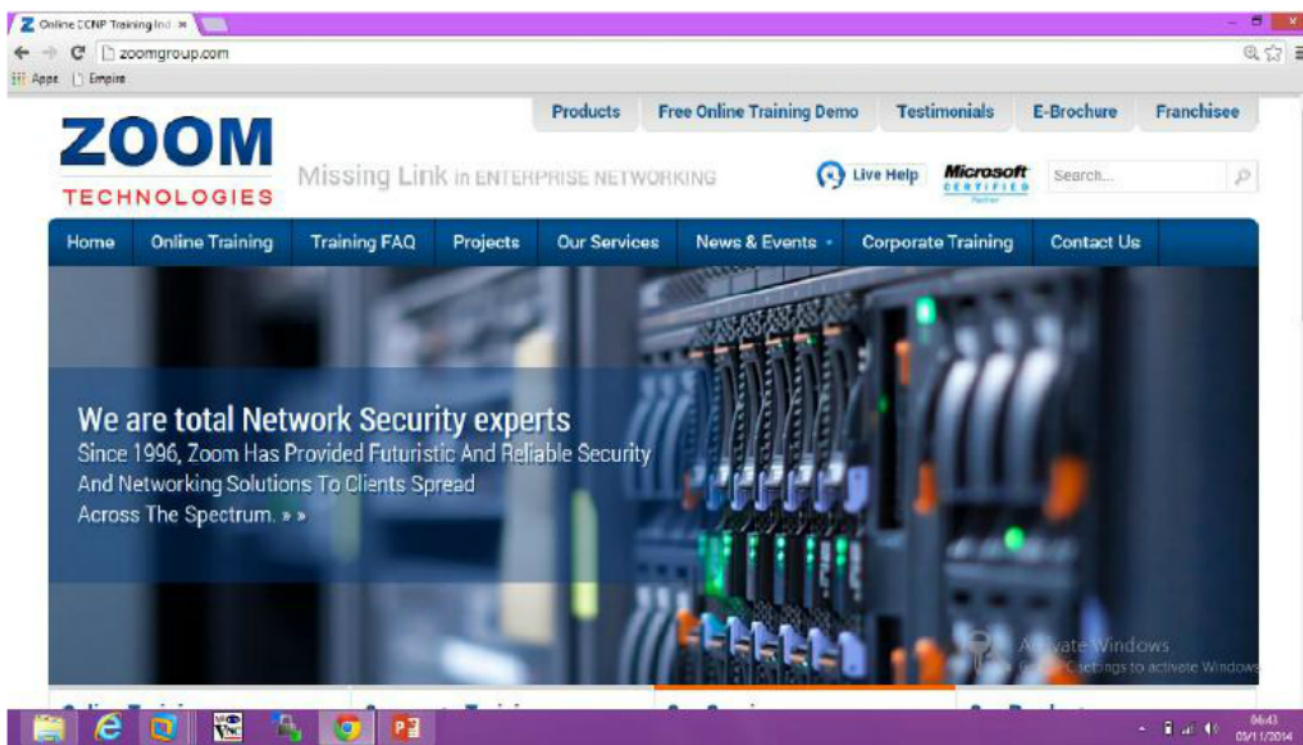
3. Open the Browser and type

```
[root@webclient ~]# firefox http://www.zoomgroup.com
```

### Verification: client trying to browse zoomgroup website



**Verification: After giving the right credentials client can browse the website**



## LAB 31: WEBMIN ADMINISTRATION

### OBJECTIVE:

To use WebMin browser based tool to manage the network services

### PRE-REQUISITE:

Two Machines with Linux Installed.

### TOPOLOGY:





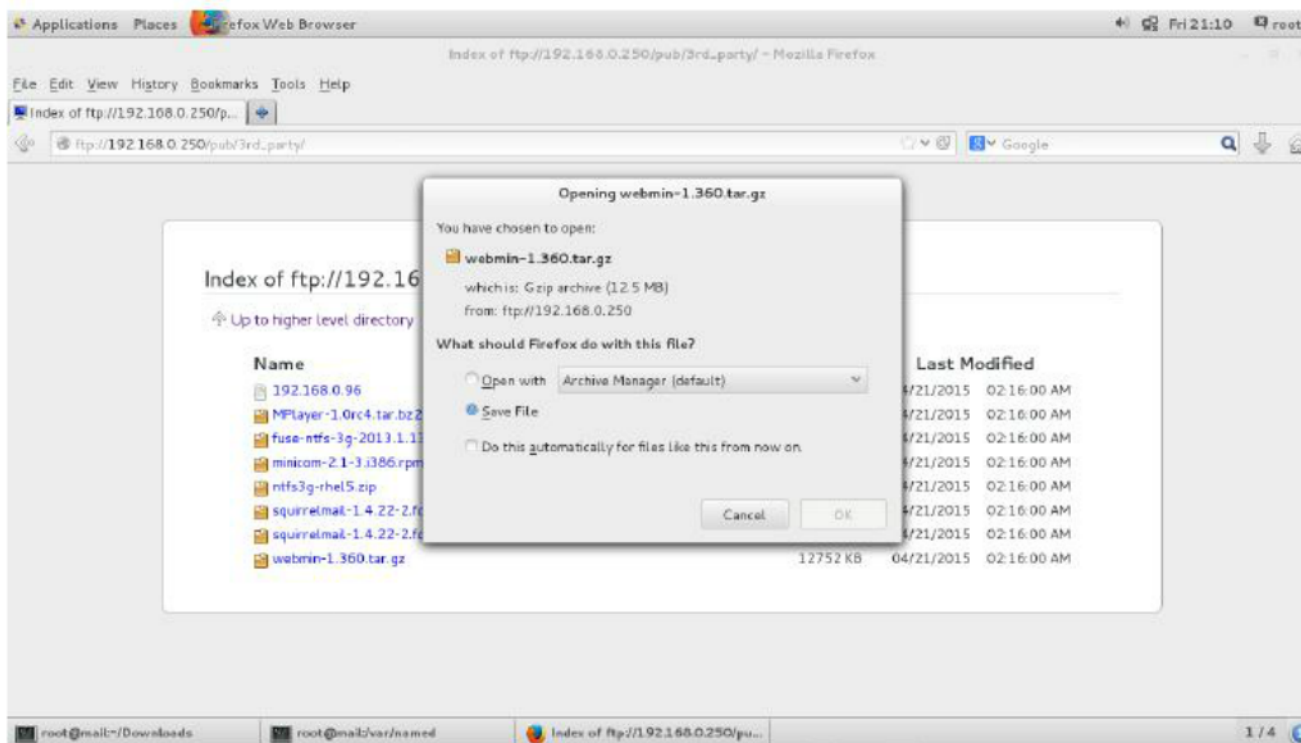
## GUI Based application to manage network via browser

1. Download webmin application from LAB server

```
[root@server ~]# firefox
```

```
ftp://192.168.0.250
```

### Verification:



2. Check the downloaded package

```
[root@server ~]# cd /root/Downloads
```

### Verification:

```
[root@server Downloads]# ls
```

```
webmin-1.360.tar.gz
```

3. Extract the package

```
[root@server Downloads]# tar -xvzf webmin-1.360.tar.gz
```

4. To list extracted directory

```
[root@server Downloads]# ls
```

### Verification:

```
Webmin-1.360 webmin-1.360.tar.gz
```



5. Enter into webmin package directory

```
[root@server Downloads]# cd webmin-1.360
```

```
[root@server Downloads]# ls
```

6. To install webmin run the following command.

```
[root@server webmail ]# ./setup.sh
```

**Verification:**

```
*****
```

```
*      Welcome to the Webmin setup script, version 1.360      *
```

```
*****
```

Webmin is a web-based interface that allows Unix-like operating systems and common Unix services to be easily administered.

Installing Webmin in /opt/webmin-1.360 ...

```
*****
```

Webmin uses separate directories for configuration files and log files.

Web server port (default 10000): <press enter>

Login name (default admin): <press enter>

Login password:

Password again:

The Perl SSLeay library is not installed. SSL not available.

Start Webmin at boot time (y/n):y

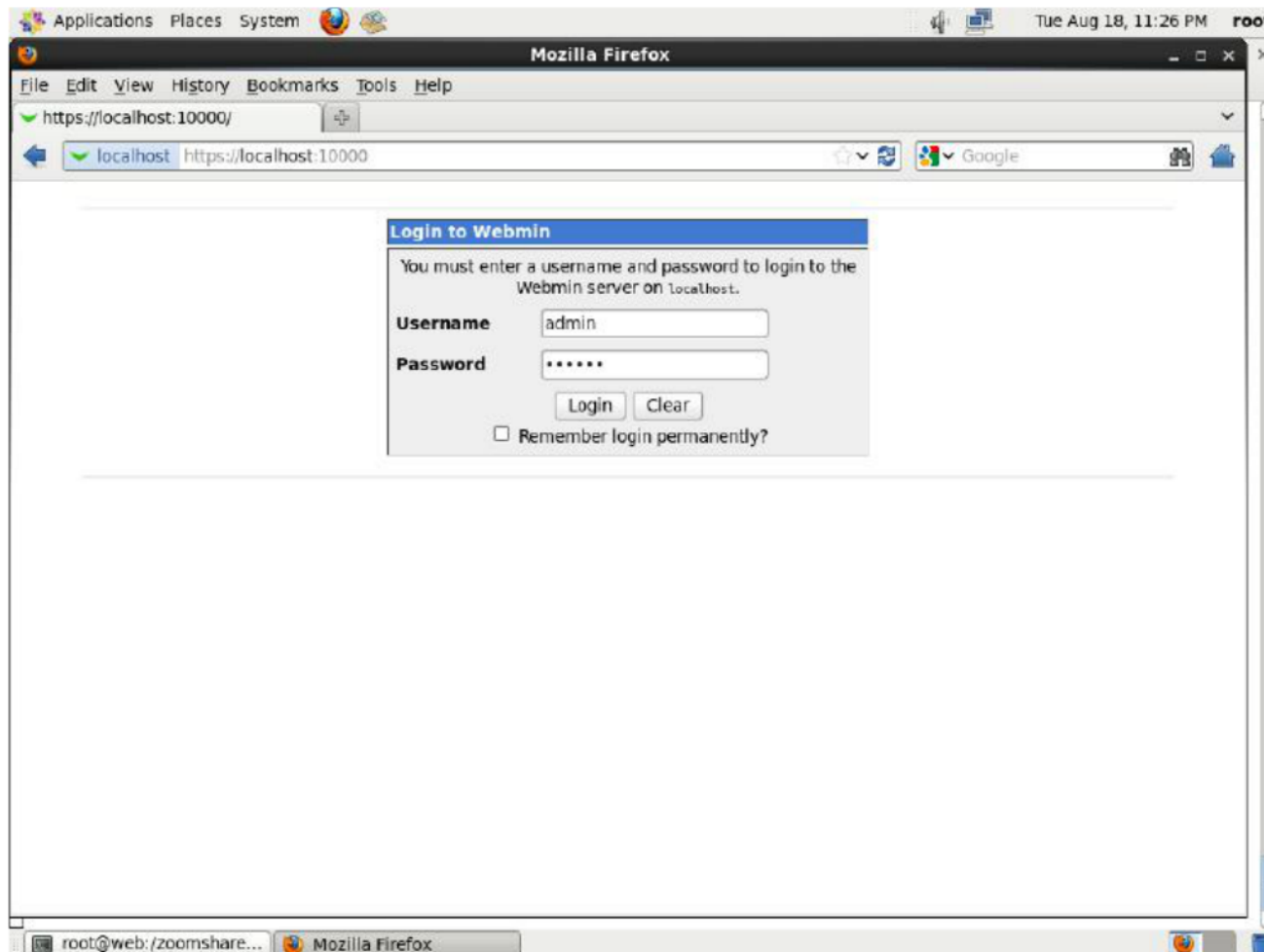
Webmin has been installed and started successfully. Use your web browser to go to **<http://localhost:10000/>** and login with the name and password you entered previously.



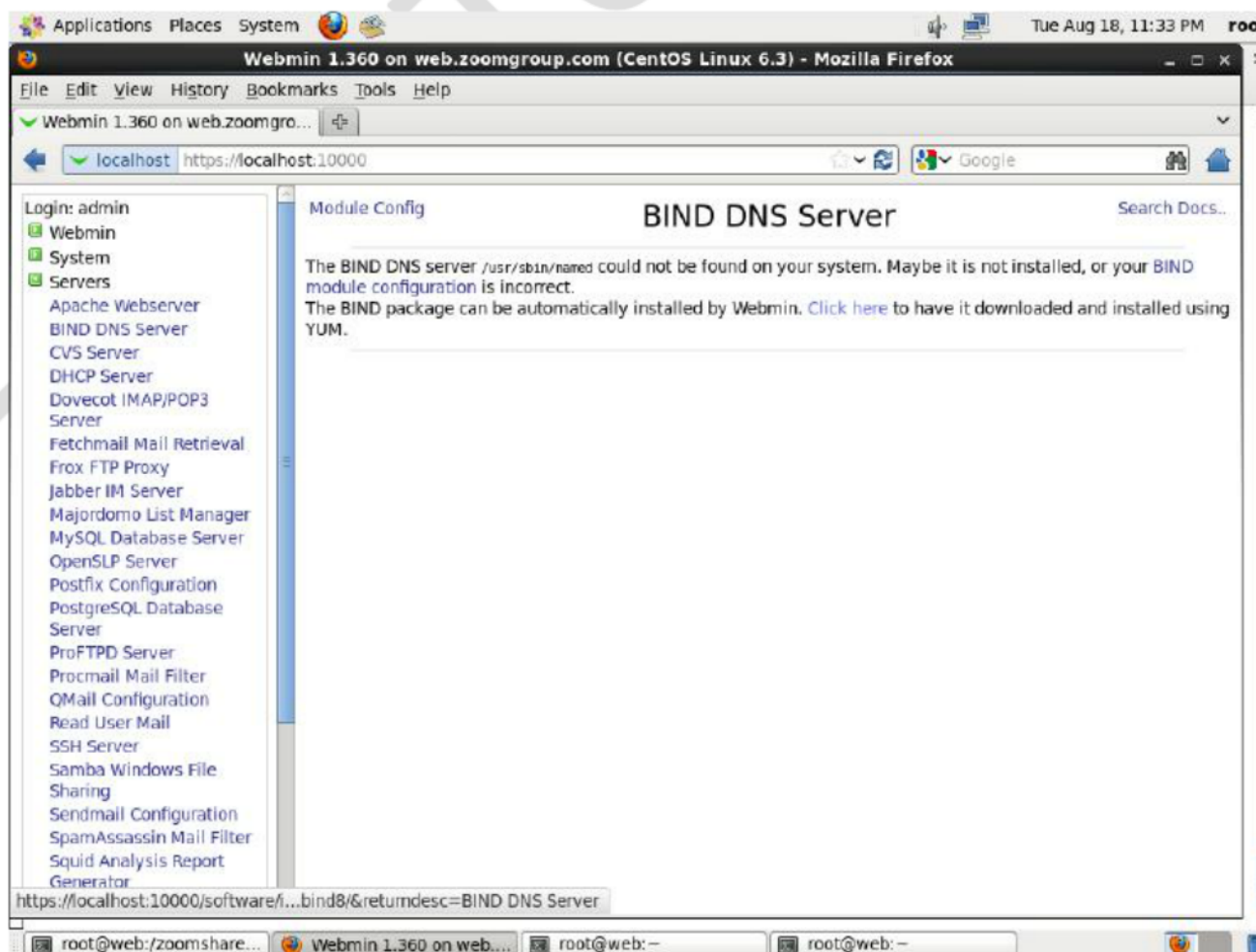
## 7. Open the Browser, to access it

```
[root@server opt]# firefox http://localhost:10000
```

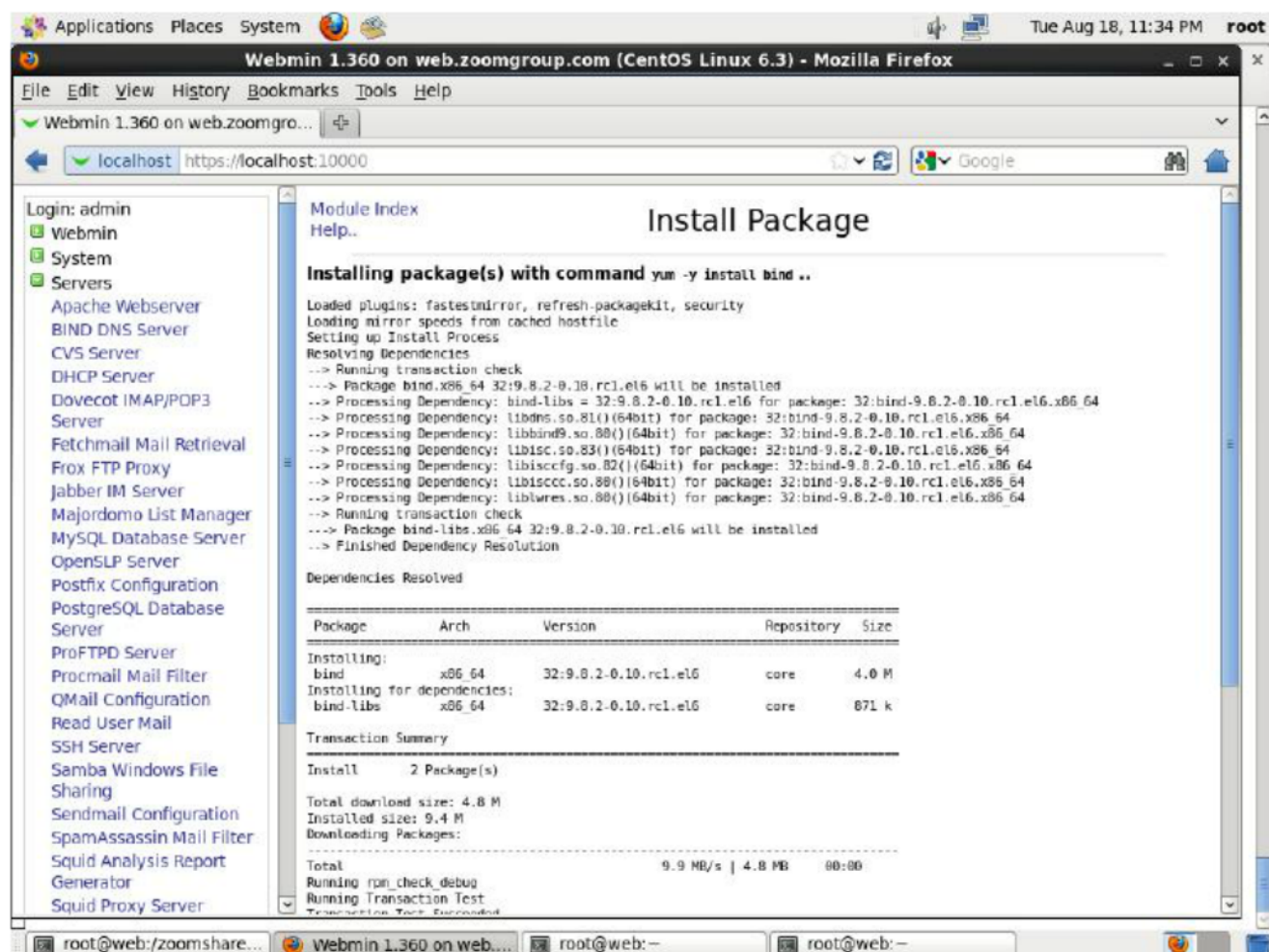
**Verification: Providing username and password**



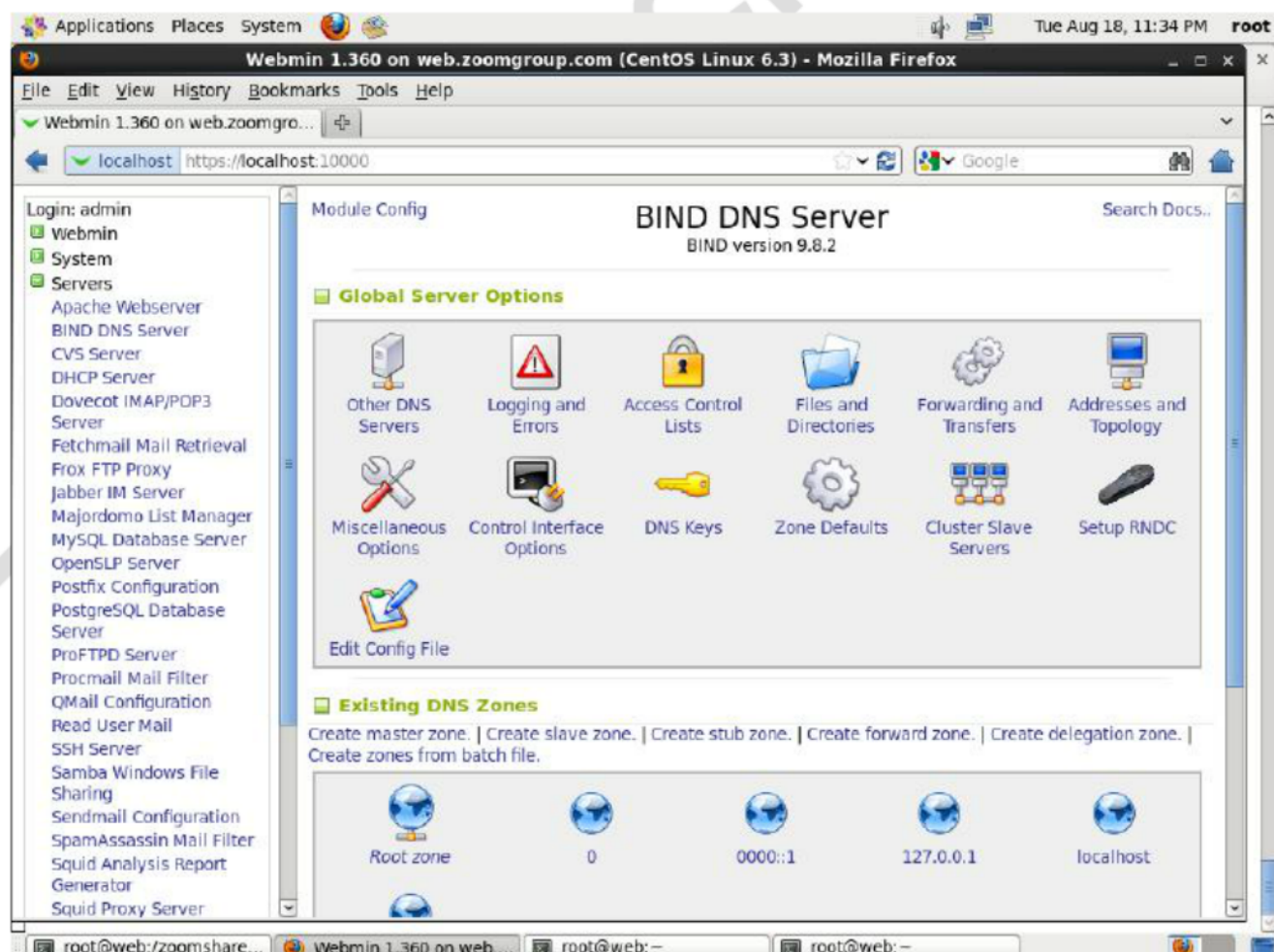
**Verification: Installing DNS applications on webmin interface**



## Verification: Installing DNS applications



## Interface for DNS configuration



8. To Change the admin password after webmin installation

```
[root@server opt]# cd webmin-1.360
```

```
[root@server webmin-1.360]# ./change pass.pl /etc/webmin/ admin admin
```

9. To Uninstall webmin

```
[root@server opt]# sh /etc/webmin/uninstall.sh
```





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**Fees: ₹ 2,500/-**

+ 14% Service Tax

## CCNA SECURITY

(Pre requisite is CCNA R&S)

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+ 14% Service Tax

## CCNP SECURITY

(Pre requisite is CCNA Security at ZOOM)

CISCO CERTIFIED NETWORK PROFESSIONAL - SECURITY

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**Batches:** Morning: 7.30 or Evening: 6.00

**Fees: ₹ 9,500/-**

+ 14% Service Tax

## CCIE SECURITY

(Pre requisite is CCNA & CCNP Security at ZOOM)

CISCO CERTIFIED INTERNETWORK - SECURITY

**Duration: 1 Month | 4 Hrs Per Day**

**Batches:** (Contact the Counselors for the next available batch)

**Fees: ₹ 15,500/-**

+ 14% Service Tax

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(Pre requisite is MCSE)

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(Pre requisite is VMware vSphere)

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  - **Ethical Hacking and Countermeasure Expert ([www.us-council.com](http://www.us-council.com))**
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